Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION

U.S. Bureau of Reclamation Operations and Maintenance of its Projects in the Snake River Basin above Brownlee Dam from Date Issued through March 2002

Agency: U.S. Bureau of Reclamation

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Approved By: Joe Scordino

Date Issued: 5/2/01

Abbreviations and Acronyms

427 kaf	427,000 acre-feet (the amount of water USBR provides for salmon flow augmentation from the Snake River basin)
1995 Biological Opinion	The Biological Opinion on operations of the FCRPS issued by NMFS on March 2, 1995
1998 Biological Opinion	The Supplemental Biological Opinion on operations of the FCRPS issued by NMFS on May 14, 1998
2000 Biological Opinion	The Biological Opinion on operations of the FCRPS issued by NMFS on December 21, 2000
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
cfs	cubic feet per second
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FR	Federal Register
IDEQ	Idaho Department of Environmental Quality
IDWR	Idaho Department of Water Resources
kaf	thousand acre-feet
kcfs	thousand cubic feet per second
lower Snake River	Mouth of Snake River upstream to Hells Canyon Dam, including four COE projects which are part of the FCRPS
Maf	Million acre-feet
mg/l	milligrams per liter
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
ODEQ	Oregon Department of Environmental Quality
PFMC	Pacific Fishery Management Council
PIT-tag	Passive Integrated Transponder tag
RM	River Mile
RPA	Reasonable and Prudent Alternative
SAR	Smolt-to-Adult Returns
SRBA	Snake River Basin Adjudication
TDG	Total Dissolved Gas
TMDL	Total Maximum Daily Load
upper Snake River	For the purposes of this biological opinion, the Snake River upstream of Hells Canyon Dam
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
VSP	Viable Salmonid Population

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1. OBJECTIVES

This is an interagency consultation pursuant to section 7(a)(2) of the Endangered Species Act of 1974 (ESA) and implementing regulations found at 50 Code of Federal Regulations (CFR) Part 402. The U.S. Bureau of Reclamation (USBR) requested consultation with National Marine Fisheries Service (NMFS) to consider the effects of continued operation and maintenance of its projects in the Snake River basin on species listed as threatened or endangered under the ESA. NMFS is responsible for administering the ESA for anadromous salmonids. There are 12 listed species that may be affected by the USBR's proposed action:

- Snake River (SR) spring/summer chinook salmon (*Oncorhynchus tshawytscha*; listed as threatened on April 22, 1992 [57 Federal Register {FR} 14653]); critical habitat designated on December 28, 1993 [58 FR 68543], and revised on October 25, 1999 [64 FR 57399]

- Snake River (SR) fall chinook salmon (*O. tshawytscha*; listed as threatened on April 22, 1992 [57 FR 14653]); critical habitat designated on December 28, 1993 [58 FR 68543]

- Upper Columbia River (UCR) spring chinook salmon (*O. tshawytscha*; listed as endangered on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Upper Willamette River (UWR) chinook salmon (*O. tshawytscha*; listed as threatened on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Lower Columbia River (LCR) chinook salmon (*O. tshawytscha*; listed as threatened on March 24, 1999 [64 FR 14308]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Snake River (SR) steelhead (*O. mykiss*; listed as threatened on August 18, 1997 ([62 FR 43937]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Upper Columbia River (UCR) steelhead (*O. mykiss*; listed as endangered on August 18, 1997 [62 FR 43937]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Middle Columbia River (MCR) steelhead (*O. mykiss*; listed as threatened on March 25, 1999 [64 FR 14517]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Upper Willamette River (UWR) steelhead (*O. mykiss*; listed as threatened on March 25, 1999 [64 FR 14517]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Lower Columbia River (LCR) steelhead (*O. mykiss*; listed as threatened on March 19, 1998 [63 FR 13347]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Columbia River (CR) chum salmon (*O. keta*; listed as threatened on March 25, 1999 [64 FR 14508]); critical habitat designated on February 16, 2000 [65 FR 7764]

- Snake River (SR) sockeye salmon (*O. nerka*; listed as endangered on November 20, 1991 [56 FR 58619]); critical habitat designated on December 28, 1993 [58 FR 68543]

The USBR (1998) submitted a biological assessment in April 1998 describing its proposed action for its projects in the Snake River basin. In April 2001, the USBR (2001) provided a supplemental biological assessment to more fully define its proposed action and to assess the proposed action's likely effects on recently listed CR chum salmon. In both of these assessments, the USBR concluded that its operations were not likely to adversely affect the listed species considered. As described in our conclusions (Section 8) and supported by our analysis of effects (Section 6), NMFS does not concur with these conclusions.

This biological opinion evaluates the effects of the USBR's proposed operation and maintenance of its 10 projects in the Snake River basin upstream from Brownlee Dam from April 2001 through March 31, 2002 (hereinafter termed "2001 operations") on listed species in the Snake and Columbia rivers and determines whether those effects are likely to jeopardize the continued existence of the affected ESA-listed salmon and steelhead or result in the destruction or adverse modification of designated critical habitat.

While this is a consultation only for operations from April 2001 through March 31, 2002, it is intended to allow sufficient time for the Snake River Basin Adjudication (SRBA) parties to conclude negotiations at which time NMFS anticipates a subsequent ESA Section 7(a)(2) consultation to assess the effects of the long-term plan for operation of these projects.

This consultation considers the effects on listed salmon and steelhead of the USBR's water storage and delivery activities to serve project purposes including contracts with reservoir spaceholders.

The USBR operates and maintains 10 irrigation projects (Table 1-1) with 22 major storage facilities, and several smaller reservoirs and diversion works in the Snake River basin upstream of Brownlee Dam (River Mile [RM] 285). Because access to historical habitat in the middle Snake River for anadromous fish was blocked in 1958 by the Brownlee Dam, no ESA-listed Snake River salmon or steelhead occupy the immediate vicinity of these projects. These USBR projects have a total active storage capacity of over 7 million acre-feet (Maf) and are authorized primarily for irrigation, flood control, and hydropower production. These projects alter the quantity and timing of water passing through the lower Snake and Columbia Rivers, thereby affecting the conditions under which juvenile and adult salmonids migrate through these river reaches and SR fall chinook salmon spawn and rear downstream of Hells Canyon Dam, the current upstream limit of salmon habitation. The extent of any water quality effects of USBR upper Snake projects below Hells Canyon Dam are presently unknown.

Table 1-1. USBR projects in the Snake River basin upstream of Brownlee Reservoir.

Project	Location	Subbasin or Stream
Minidoka	Southern Idaho and western Wyoming from Twin Falls, Idaho to Jackson Lake, Wyoming	Snake River
Palisades	Eastern Idaho, on Wyoming Border	Snake River
Michaud Flats	Southern Idaho, near Pocatello	Snake River
Little Wood River	South-central Idaho, north of Twin Falls	Little Wood River
Boise	Southwest Idaho, near Boise	Boise and Payette rivers
Mann Creek	Southwest Idaho, northwest of Boise	Weiser River
Owyhee	Eastern Oregon and southwest Idaho, near Ontario, Oregon	Owhyee and Snake rivers
Vale	Eastern Oregon, west of Ontario	Malheur River
Burnt River	Eastern Oregon, south of Baker City	Burnt River
Baker	Eastern Oregon, near Baker City	Powder River

1.1 Application of ESA Section 7(a)(2) Standards–Jeopardy Analysis Framework

To achieve the objectives of this biological opinion, NMFS uses a five-step approach for applying the ESA Section 7(a)(2) standards. The steps are as follows:

1. Define the biological requirements and current status of each listed species.

2. Evaluate the relevance of the environmental baseline to the species' current status.

3. Determine the effects of the proposed or continuing action on listed species.

4. Determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the effects of the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages.

5. Identify reasonable and prudent alternatives (RPAs) to a proposed or continuing action when that action is likely to jeopardize the continued existence of a listed species or destroy or adversely modify its critical habitat. Thus, this step is relevant only when the conclusion of the previously described analysis for Step 4, above, is that the proposed action would jeopardize listed species. The RPA would have to both reduce the mortality associated with the proposed action to a level that does not jeopardize the species, and maintain (or restore) essential habitat features so that there is no adverse modification of

designated critical habitat. An analysis to determine the sufficiency of the RPA would be based on the same considerations described above.

The fourth step of the application framework calls for a two-part analysis. The first part focuses on the action area, delineated as the geographic extent of direct and indirect effects of the action (50 CFR Section 402.02). The effects of the action, the effects of the environmental baseline, and the cumulative effects in the action area are considered together relative to the action area biological requirements of the various listed species. The essential features of critical habitat guide in this part of the analysis.

The second part of the analysis places the action area investigation in the context of the full salmon life cycle, considering each Evolutionarily Significant Unit's (ESU) species-level biological requirements. This comprehensive analysis is necessary to fully evaluate the significance of each action under consultation to the biological requirements of the listed species in all life stages. NMFS looks beyond the particular action area for this analysis to consider measures likely to be necessary in all life stages that, in combination, would ensure that the biological requirements of the listed species will be met and thereby ensure its continued existence.

Pursuant to the ESA, to fully consider the current status of the listed species (50 CFR Section 402.14(g)(2)), NMFS evaluates the species-level biological requirements of a species, subspecies, or distinct population segment level. For Pacific salmonids, NMFS evaluates species-level biological requirements as they relate to ESUs. Since 1995, NMFS has developed the viable salmonid population (VSP) concept as a tool to evaluate whether the species-level requirements of ESUs are being met (McElhany et al. 2000). Each salmonid ESU may contain multiple independent populations. VSPs are independent populations that have a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over 100 years. The attributes associated with VSPs include adequate abundance, productivity (population growth rate), population spatial scale, and diversity. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle and are, therefore, distinguished from the more specific biological requirements associated with the action area and the particular action under consultation. Species-level biological requirements are influenced by all actions affecting the species throughout its life cycle and may be broader than the requirements of any specific independent population in the ESU. The action-area effects must be reviewed in the context of these species-level biological requirements to evaluate the potential for survival and recovery, relevant to the status of the species, given the comprehensive set of human activities and environmental conditions affecting the species.

Step 4 of the application framework ultimately requires that NMFS determine whether the species-level biological requirements can be met considering the significance of the effects of the action under consultation. Recovery planning can provide the best guidance for making this determination. Recovery plans for listed salmon call for measures in each life stage that are based upon the best available scientific information concerning the listed species' biological requirements for survival and recovery. As the statutory goal of the recovery plan is for the species' conservation and survival, it necessarily must add these life-stage specific measures together to result in the survival of the species and its recovery. For this reason, the recovery plan is the best source for measures and requirements necessary in each life stage to meet the biological requirements of the species across its life cycle.

Recovery planning will identify the feasible measures that are needed in each stage of the salmonid life cycle for conservation and survival within a reasonable time. Measures are feasible if they are expected both to be implemented and to result in the required biological benefit. A time period for recovery is reasonable depending on the time requirements for implementation of the measures and the confidence in the survival of the species while the plan is implemented. The plan must demonstrate the feasibility of its measures, the reasonableness of its time requirements, and how the elements are likely to achieve the conservation and survival of the listed species based on the best science available.

In 1995, NMFS relied on the proposed Snake River salmon recovery plan, issued in draft in March 1995. Since 1995, the number of listed salmonid species has gone from three to 12, and the need for recovery planning for Columbia basin salmonids has quadrupled. Rather than finalize the 1995 proposed recovery plan, NMFS has developed guidelines for basin-level, multispecies recovery planning on which individual, species-specific recovery plans can be founded. "Basin-level" recovery planning encompasses habitat, harvest, hatcheries, and hydro. This recovery planning analysis is contained in the document entitled "Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery Strategy" (hereafter, the Basinwide Recovery Strategy [Federal Caucus 2000]). The Basinwide Recovery Strategy replaces the 1995 proposed recovery plan for Snake River stocks until a specific plan for those stocks is developed on the basis of the Basinwide Recovery Strategy. Recovery plans for each individually listed species will provide the particular statutorily required elements of recovery goals, criteria, management actions, and time estimates that are not developed in the Basinwide Recovery Strategy.

Until the species-specific recovery plans are developed, the Basinwide Recovery Strategy provides the best guidance for judging the significance of an individual action relative to the species-level biological requirements. In the absence of full recovery planning, NMFS strives to ascribe the appropriate significance to actions to the extent available information allows. Where information is not available on the recovery needs of the species, either through recovery planning or otherwise, NMFS applies a conservative substitute that is likely to exceed what would be expected of an action if information were available.

In the absence of information on the recovery needs of the species, the uncertainty of whether an action avoids jeopardy or adverse modification of critical habitat is greater. Therefore, an action must avoid or offset adverse effects to the listed species to a greater extent than could likely be determined with the benefit of the type of information on recovery needs that is normally developed in a recovery plan.

2. EVENTS LEADING TO THIS CONSULTATION

2.1 Background

Due to the status of anadromous salmonids in the Columbia River basin (see Section 4) and the recognition that hydropower and multipurpose dam development were primary causal agents of these species' declines,[1] the operating agencies of Federal dams have been consulting with NMFS under section 7 of the Endangered Species Act since 1992. Since that time, NMFS has issued a series of biological opinions regarding the operation and maintenance of these facilities. Of particular importance to this consultation is the biological opinion NMFS issued on March 2, 1995, on the Operation of the Federal Columbia River Power System (FCRPS) and Juvenile Transportation Program in 1995 and Future Years (1995 FCRPS Biological Opinion). In that opinion, NMFS determined that the operation of the FCRPS, as proposed by the U.S. Army Corps of Engineers (COE), Bonneville Power Administration (BPA), and the USBR, would jeopardize the continued existence of threatened and endangered Snake River spring/summer chinook, fall chinook, and sockeye salmon and adversely modify their critical habitat.

The 1995 FCRPS Biological Opinion set out a reasonable and prudent alternative (RPA) for the operation and configuration of the FCRPS to meet the no-jeopardy requirement of the ESA for these Snake River salmon ESUs. It identified "immediate, intermediate, and long-term actions that will improve the operation and configuration of the hydropower system" (1995 FCRPS Biological Opinion, p. 91). One of the RPA measures established flow objectives for specific locations on the Snake and Columbia rivers to improve juvenile salmon survival on their downstream migrations, and prescribed measures intended to improve the likelihood of achieving those objectives. To that end, RPA 1. b. directed the USBR to annually provide "427 thousand acre-feet (kaf) of flow augmentation from the upper Snake River as identified in the Power Planning Council's Strategy for Salmon in 1995-97, taking such actions as are necessary to ensure a high probability of providing that volume by 1998, "and to secure additional supplies as may be necessary to further reduce human-caused mortality of listed salmon in the Snake River." This measure further specified that the USBR "secure water for flow augmentation in a manner that is consistent with applicable state law and from willing sellers." The RPA was adopted by the COE, USBR, and BPA in their Records of Decision. Supplemental biological opinions issued since 1995 have continued these objectives and measures.

2.2 Supplemental Biological Opinions

On May 14, 1998, NMFS issued a supplemental biological opinion entitled "Operation of the Federal Columbia River Power System Including the Smolt Monitoring Program and the Juvenile

[1] The Factors for a Decline, Supplement to the Notice of Determination of Snake River Spring/Summer Chinook Salmon Under the Endangered Species Act, NMFS, June 1991, p. 8., estimated that hydropower and multipurpose dams were responsible for about 80% of the total decline in anadromous fish runs in the basin.

Fish Transportation Program: A Supplement to the Biological Opinion Signed on March 2, 1995, For the Same Projects" (1998 Supplemental FCRPS Biological Opinion). This biological opinion evaluated the operation of the FCRPS on newly listed threatened and endangered steelhead ESUs from the upper Columbia, lower Columbia, and Snake rivers. In that biological opinion, NMFS determined that the operation of the FCRPS, in accordance with the RPA measures specified in the 1995 FCRPS Biological Opinion as modified in the 1998 Supplemental FCRPS Biological Opinion, would not jeopardize the continued existence of threatened Snake River steelhead. The 1998 Supplemental FCRPS Biological Opinion reaffirmed the need for spring flow objectives at Lower Granite Dam, screening juveniles and adults (fallbacks) from turbine entrances, and expanded the spill program at many COE mainstem projects.

Although the 1995 and 1998 Supplemental FCRPS Biological Opinions found that providing 427 kaf for flow augmentation, when combined with other measures throughout the basin, was adequate to avoid jeopardizing listed Snake River salmon during the interim period (1995 through 1999), the USBR, U.S. Fish and Wildlife Service (USFWS), and NMFS agreed to conduct a more detailed analysis of project operations, to fully evaluate and document the USBR's ability to comply with the RPA measures, and to evaluate additional measures and impediments that could affect future efforts to avoid jeopardizing listed species and/or adversely modifying their critical habitat.

A supplemental opinion covering the USBR's project operations upstream from Hells Canyon Dam was signed on December 9, 1999. This biological opinion was supplemental to the 1995 FCRPS Biological Opinion and concluded that because project operations conformed to the actions identified in the 1995 FCRPS Biological Opinion's RPA, "the continued operation and maintenance of the USBR's projects in the Snake River basin upstream Brownlee Dam is not likely to jeopardize the continued existence of listed Snake River steelhead, sockeye, spring/summer chinook; or result in the destruction or adverse modification of their critical habitat. Based on the similarity of effects of USBR's Snake River operations on other listed and proposed anadromous fish in the rest of the Columbia basin, NMFS also determines that the continued operation and maintenance of USBR's projects in the Snake River basin upstream of Brownlee Dam, is not likely to jeopardize the continued existence of listed steelhead, chinook, and chum ESUs in the rest of the Columbia River basin, or result in the destruction or adverse modification of their critical habitat." The 1999 supplemental opinion included one reasonable and prudent measure to reduce incidental take caused by operating the projects and several conservation recommendations aimed at protecting and increasing the surety that 427 kaf of water could be delivered by the USBR for augmentation throughout the life of the 1995 FCRPS Biological Opinion.

NMFS issued another supplemental biological opinion on February 4, 2000.[2] That opinion considered the effects of FCRPS operations on six species that NMFS listed as threatened or endangered in March 1999. NMFS determined that the 1995 RPA, as modified by the 1998 proposed action and several additional interim measures, would not jeopardize the continued existence of any of the newly listed species for the remainder of the interim period. The decision-making process and timing for the long term, again, remained consistent with the 1995 FCRPS Biological Opinion.

The 1995 FCRPS Biological Opinion and both the 1998 and 2000 supplements acknowledge that the species' biological requirements in the migratory corridor are likely to be met over the long-term only if there are major changes to the operation and configuration of FCRPS Columbia and Snake river dams and reservoirs that result in significant survival improvements. The actions specified in these biological opinions were presented as interim measures to improve the survival of ESA-listed Columbia and Snake river salmon and to generate needed information for a decision regarding the long-term configuration of the FCRPS.

2.3 2000 FCRPS Biological Opinion and Basinwide Recovery Strategy

On December 21, 2000, NMFS issued a new biological opinion on the operation and maintenance of the FCRPS and the USBR's 19 other projects in the Columbia River basin (2000 FCRPS Biological Opinion) that covers operation of these projects for 10 years. This opinion superceded all previous consultations on the FCRPS, including the 1999 Supplemental FCRPS Biological Opinion on the USBR's upper Snake River project operations. The RPA in the 2000 FCRPS Biological Opinion adopts a broad range of actions, both within and outside the action area, to achieve the population growth targets necessary to ensure survival and to achieve a reasonable likelihood of recovery for Columbia basin salmon and steelhead. In doing so, it anticipates that other actions will be implemented within the action area that will achieve the needed population growth improvements.

The Federal Caucus released its Basinwide Recovery Strategy (Basinwide Strategy) in December 2000. The Federal Caucus is composed of NMFS, COE, USBR, BPA, the U.S. Environmental Protection Agency (EPA), the Bureau of Indian Affairs, the Bureau of Land Management, USFWS, and the U.S. Forest Service. The Basinwide Strategy is a comprehensive multispecies conceptual recovery plan that describes a range of potential Federal activities that could meet ESA obligations and rebuild Columbia basin stocks. Both the 2000 FCRPS Biological Opinion and the Basinwide Strategy anticipated that water releases from FCRPS reservoirs would be coordinated with those from Canada, the upper Snake River basin, and the Hells Canyon Complex to provide direct and indirect survival benefits to salmon and steelhead.

[2] "Supplemental Biological Opinion—Operation of the Federal Columbia River Power System Including the Juvenile Fish Transportation Program: A Supplement to the Biological Opinions Signed on March 2, 1995, and May 14, 1998, for the Same Projects" (NMFS 2000d).

2.4 Snake River Basin Adjudication

During the process leading up to the 2000 FCRPS Biological Opinion, the USBR, NMFS, the DOI, and the Nez Perce Tribe were negotiating with the State of Idaho and Idaho water interests to resolve Tribal and Federal water right claims in the Snake River basin that were filed in the SRBA, a general adjudication of water rights in Idaho District Court. The negotiations are being conducted under the auspices of a court-appointed mediator. Because the USBR was unable to fully define a long-term proposed action for its Snake River basin projects until the SRBA settlement is achieved, it requested to withdraw those projects from the scope of the proposed action considered in the 2000 FCRPS Biological Opinion. At that time, the USBR expected that an agreement could be reached prior to the 2001 irrigation season, facilitating a deferred consultation (USBR 2000).

Negotiations are ongoing and resolution is anticipated soon. However, the details of a long-term agreement have not yet been documented. In deference to the SRBA mediation, therefore, the USBR proposed this 2001 operation for these projects as a bridge to achieving a long-term agreement. The present opinion therefore covers the USBR's Snake River projects from the date of issuance through March 2002.

2.5 Summary of Events Leading to this Consultation

- May 20, 1997: The USBR asked NMFS and the USFWS to provide a listing of ESA-listed, proposed, and candidate species in the project area.

- June 16, 1997: The USBR informed irrigation water users and Indian Tribes, by letter, of the decision to consult under section 7 of the ESA.

- June 20, 1997: NMFS and the USFWS sent lists of ESA-listed, proposed, and candidate species potentially found in the project area or affected by USBR water operations.

- January 28, 1998: The USBR sent a draft biological assessment to NMFS and the USFWS for review.

- March 16, 1998: The USBR reviewed comments received on draft biological assessment and revised biological assessment as needed.

- April 24, 1998: The USBR sent a final biological assessment to NMFS and the USFWS.

- August 17, 1998: NMFS and the USFWS sent a letter to Columbia River basin Indian Tribes soliciting their participation in the development of this biological opinion.

- April 8, 1999: NMFS released a draft biological opinion for review and comment by our Federal, state, and Tribal co-managers at the Implementation Team.
- December 9, 1999: NMFS issued the supplemental biological opinion.
- December 21, 1999: The FCRPS Action Agencies (BPA, USBR, COE) submitted their final biological assessment for the FCRPS including 32 USBR projects in the basin.
- May 11, 2000: The USBR submitted several items of additional information on the water consumption and water quality effects of its projects.
- July 27, 2000: NMFS distributed a draft FCRPS Biological Opinion that included upper Snake River basin projects.
- December 15, 2000: The USBR formally requested the removal of all of its projects in the Snake River basin from the FCRPS consultation.
- December 21, 2000: NMFS issued its biological opinion on the continued operation of the FCRPS excluding all of the USBR's projects in the Snake River basin.

3. PROPOSED ACTION

The USBR's proposed action is the continued operation and maintenance of all USBR-owned or -operated water management facilities in the Snake River basin upstream of Brownlee Reservoir (Table 3-1).[3] These facilities include storage dams, reservoirs, and major diversion structures that are part of the USBR projects in the Snake River basin upstream from Lower Granite Reservoir, as well as two storage facilities constructed by the COE.[4] Total active storage capacity in USBR-owned or controlled facilities is about 7,162,000 acre-feet including space in Lake Lowell, an off-stream storage reservoir in the Boise Project.

The duration of the proposed action is one year from the date of the biological assessment (April 6, 2001). NMFS expects that this consultation will be reinitiated following completion of the mediationof Federal- and Tribal-reserved water rights claims currently underway through negotiations under Idaho's SRBA, and at least 135 days prior to the expiration of this opinion.

The details of the operational portion of the proposed action for this consultation are found in the USBR's 1998 Biological Assessment and a supplement to that assessment provided to NMFS on April 6, 2001 (USBR 2001). This biological opinion considers all of those details as if they were set forth in this section. In particular, NMFS understands that the USBR expects to provide as much water for flow augmentation as is possible in 2001 recognizing that it is an extremely low water year, that 2000 was also a lower than average water year providing little carryover supplies, and that the unusual electrical energy situation in the western United States is a significant factor in the availability of water this year. While the USBR does not expect to provide 427 kaf this year, it expects that the water available for flow augmentation is consistent with prior projections of volumes to be expected in a low water such as 2001 under the 1998 proposed action.

[3] Most USBR projects in the Snake River basin (Table 1-1) include more than one facility (Table 3-1). A complete description of projects, facilities, and operations can be found in the USBR's 1998 Biological Assessment.

[4] The proposed action includes the operation of two projects constructed by COE: Lucky Peak Dam, located on the Boise River about 8 miles upstream of the city of Boise, and Ririe Dam, located on Willow Creek, a tributary which enters the Snake River near the city of Idaho Falls. These facilities are included in the proposed action because their operation is integrated with those of USBR facilities, and because the USBR markets the storage in these reservoirs for irrigation water supply.

Table 3-1. USBR facilities in the Snake River basin. Source: USBR 1998a.

Name	Stream	River Mile	Active Capacity (acre-feet)[1]	Powerplant	0&M[2]
SNAKE RIVER MAIN STEM FROM HEADWATER TO HENRYS FORK					
Jackson Lake Dam	Snake R.	988.9	847,000	-	R
Palisades Dam	Snake R.	901.6	1,200,000	USBR	R
Henrys Fork					
Island Park Dam	Henry Fork	91.7	135,205	Non-Federal	T-F
Grassy Lake Dam	Grassy Cr.	0.5	15,200	-	T-F
Willow Creek Basin					
Ririe Dam[3]	Willow Cr.	20.5	80,500	-	R
SNAKE RIVER MAIN STEM FROM HENRYS FORK TO MILNER DAM					
American Falls Dam	Snake R.	714.0	1,672,600	Non-Federal	R
Minidoka Dam	Snake R.	674.5	95,200	USBR	R
BIG WOOD RIVER BASIN					
Little Wood River Dam[4]	Little Wood R.	78.8	30,000	Non-Federal	L
OWYHEE RIVER BASIN					
Owyhee Dam	Owyhee R.	28.5	715,000	Non-Federal	T-O
BOISE RIVER BASIN					
Anderson Ranch Dam	S.F. Boise R.	43.5	423,200	USBR	R
Arrowrock Dam	S.F. Boise R.	75.4	286,600	-	R
Lucky Peak Dam[5]	Boise R.	64.0	264,400	Non-Federal	C
Boise River Diversion Dam	Boise R.	61.4	0	USBR	T-B
Hubbard Lake Dam	Off-stream (Boise R.)	-	0	-	T-B
Deer Flat Dams	Off-stream (Boise R.)	-	159,400	-	T-B
MALHEUR RIVER BASIN					
Warm Springs Dam	Malheur R.	114.0	191,000	-	T-W
Agency Valley Dam	N.F. Malheur R	15.0	59,900	-	T-V
Harper Diversion Dam	Malheur R.	65.2	0	-	T-V
Bully Creek Dam	Bully Cr.	12.5	30,000	-	T-V
PAYETTE RIVER BASIN					
Cascade Dam	N.F. Payette R	38.6	653,200	Non-Federal	R
Deadwood Dam	Deadwood R.	18.0	161,900	-	R
Black Canyon Dam	Payette R.	38.7	0	USBR	R
WEISER RIVER BASIN					
Mann Creek Dam	Mann Cr.	13.2	10,900	-	T-M
BURNT RIVER BASIN					
Unity Dam	Burnt R.	63.6	25,000	-	T-BR
POWDER RIVER BASIN					
Mason Dam	Powder R.	122.0	90,500	-	T-BV
Thief Valley Dam	Powder R.	70.0	13,300	-	T-LP

[1]Capacities rounded to nearest 100 acre-feet
[2]C=COE facility, USBR administers water service contracts for irrigation; R=Reserved facility operated and maintained by USBR: T=Transferred facility operated by a contracting entity, B=Boise Project Board of Control; BR=Burnt River Irrigation District BV=Baker Valley Irrigation District; F=Fremont-Madison Irrigation District; L=Little Wood River Irrigation District; LP=Lower Powder River Irrigation District; LO=Lewiston Orchards Irrigation District; M=Mann Creek Irrigation District; O=Owyhee Irrigation District; V=Vale Oregon Irrigation District; W=Warmsprings Irrigation District.
[3]Operated and maintained by USBR (constructed by COE).
[4]Title ownership is the Little Wood River Valley Irrigation District.
[5] USBR administers water service contracts for irrigation.

3.1 Plan for Providing Water for Flow Augmentation in 2001

The USBR Supplemental BA described the proposed action as follows:

> "The Proposed Action . . . has two components. The first is Reclamation's operations and maintenance (O&M) program on ten Reclamation projects in the Upper Snake River basin for up to a 1-year period from the date of this Supplemental BA. The second is delivery of flow augmentation water from various sources in the Snake River basin. The 1-year period is expected to permit a long-term resolution of the Nez Perce Settlement negotiations. The Proposed Action includes all actions in performance of Reclamations contracts during the 1-year period." (p. 1).

The flow augmentation action was one of many interim measures that NMFS prescribed as part of an RPA that would satisfy Section 7(a)(2) standards in its biological opinion issued March 2, 1995, for the FCRPS. NMFS further confirmed the feasibility of the USBR proposed operation to achieve that RPA measure in a supplement to that biological opinion issued on December 9, 1999.

Due to low anticipated runoff this year (NOAA 2001) and the deepening electrical energy shortage across the western United States, the USBR anticipates that it will not be able to deliver the full 427 kaf of water for flow augmentation in 2001 (USBR 2001). Specifically, USBR (2001) estimates that space in project reservoirs that is uncontracted and previously used to provide augmentation water, will not be available in 2001. Most USBR reservoirs will fail to refill in 2001 and reservoir space used in the flow augmentation program is the last to fill under Idaho law (i.e., water the USBR provides to contract holders has priority when supplies are short). Further, the USBR (2001) estimates that given the very tight water market, it is unlikely that spaceholders would commit more water to the rental pools than anticipated irrigation demand would consume.[5] Thus, water from the rental pools, a resource that has provided over half of recent flow augmentation volumes, is not likely to be available in significant quantities in 2001. Powerhead space, considered a resource of last resort in previous consultations, is unlikely to be delivered this year due to concerns that drawing water from powerhead space would likely result in powerhouse shutdowns, some irrigation diversion structures becoming inoperable, and impacts to resident species. In most years, ample carryover storage would be available to ensure continued powerplant operation even after a portion of the water stored for powerhead was released. Carryover storage is expected to be small to nonexistent this year. According to USBR (2001), under the current energy shortage and the attendant high wholesale cost of electrical power, replacing lost generation would be extraordinarily expensive and the lost generation capacity could impact system reliability and voltage control.

Nonetheless, the USBR has expressed its commitment to seek additional water and to deliver whatever water becomes available in 2001. Less than 60 kaf is currently available from firm

[5] Under Idaho water rental pool rules, water consigned for sale to the rental pool is made available for purchase by agricultural users first.

USBR sources above Lower Granite Dam (Table 3-2). Details of this proposed operation are provided in the USBR's Biological Assessment (2001).

Table 3-2. Water identified in the Snake River basin for potential delivery for salmon flow augmentation during 2001. Source: USBR 2001.

Source	Acre-Feet	Availability
Shoshone-Bannock lease	38,000	available
Oregon natural flows	17,650	available
Lemhi lease	6,000	likely

In addition to the sources listed in Table 3-2, USBR intends to investigate the use of storage water in the Boise (20 kaf) and Payette (30 kaf) projects that is currently dedicated for use for winter instream flows to support resident fisheries, including, but not limited to ESA-listed Bull Trout (USFWS 1999). Deadwood storage has been designated to protect bull trout. USBR will work with USFWS to identify potential alternative means to protect bull trout. The storage in Boise River reservoirs has been reserved to provide winter minimum flows of 80 cfs through the city of Boise. The use of this water is more problematic, since it represents all of the water that might be available in the following winter (2002/2003) available to meet instream flows. USBR will work with affected interests to determine the availability of this water for flow augmentation.

Water deliveries will be coordinated with the Regional Forum's Technical Management Team. The Technical Management Team was established under the 1995 Biological Opinion for the purpose of managing available water resources to benefit salmon and is open to representatives of Federal agencies (USBR, COE, BPA, NMFS, USFWS, and EPA), states (Idaho, Oregon, Washington, Montana, and Alaska), the Northwest Power Planning Council, and Columbia River Basin Treaty Tribes. The Technical Management Team is responsible for making recommendations to the USBR and COE on dam and reservoir operations, including, but not limited to, delivery and shaping of water to augment flows, juvenile fish transportation operations, and spill at mainstem dams to optimize passage conditions for juvenile salmon.

4. BIOLOGICAL INFORMATION

4.1 Life Histories, Factors for Decline, and Current Rangewide Status

The 12 ESUs that may be affected by the USBR's proposed action are identified in Section 1. The life histories, factors for decline, and current rangewide status of these ESUs are described in Section 4 of the 2000 FCRPS Biological Opinion. Additional relevant information was also presented in Appendices A and C of that document and in Appendix A to the paper "A Standardized Quantitative Analysis of the Risks Faced by Salmonids in the Columbia River Basin" (McClure et al. 2000a). NMFS incorporates this information by reference in this biological opinion.

4.2 Species-Level Biological Requirements

The species-level biological requirements of the 12 listed ESUs are described in Section 4 and Appendix C of the 2000 FCRPS Biological Opinion, which are incorporated by reference.

4.3 Species Status With Respect to Species-Level Biological Requirements

NMFS estimated the current and expected median annual population growth rate (lambda), the expected survival change from the 2000 FCRPS Biological Opinion RPA, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the RPA in the 2000 FCRPS Biological Opinion (Table 4-1).

The current status of each species indicates that the species-level biological requirements described in Section 1.1 are not being met for any of the 12 ESUs considered in this consultation. Improvements in survival rates (assessed over the entire life cycle) are necessary to meet species-level biological requirements in the future.

Table 4-1. Estimates of current and expected median annual population growth rate (lambda), expected survival change from implementing the RPA in the 2000 FCRPS Biological Opinion, and additional per-generation survival improvements needed to achieve indicators of NMFS' jeopardy standard after implementing the proposed action for Columbia River basin salmon and steelhead ESUs.

Note: the information in this table was extracted from Section 9.7 of the 2000 FCRPS biological opinion. The methods and assumptions used in this analysis are fully described in that document and its appendices.							Additional Change In Life-Cycle Survival Needed to Achieve:			
	1980-Current Lambda		Expected Survival Change from RPA		Expected Lambda		5% Extinction Risk In 100 Years		50% Recovery In 48 Years or Lambda = 1.0	
Spawning Aggregation	Low[1]	High[2]	Low[3]	High[4]	Low[5]	High[6]	Low[7]	High[8]	Low[7]	High[8]
SR spring/summer chinook	**0.82**	**0.91**	**1.30**	**1.38**	**0.86**	**0.98**	**1.46**	**1.56**	**1.12**	**1.89**
SR fall chinook	**0.87**	**0.92**	**1.49**	**1.86**	**0.96**	**1.07**	**0.66**	**0.94**	**0.93**	**1.44**
UCR spring chinook salmon	0.84	0.85	1.36	1.54	0.90	0.94	1.20	1.41	1.32	1.58
UWR chinook salmon	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
LCR chinook salmon	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*
SR steelhead (A & B-run)	**0.72**	**0.83**	**1.50**	**1.61**	**0.78**	**0.91**	**0.93**	**1.94**	**1.58**	**3.60**
UCR steelhead	0.69	0.83	1.39	1.59	0.75	0.94	1.02	2.36	1.26	2.93
MCR steelhead	0.77	0.84	1.21	1.25	0.80	0.88	*N/A*	*N/A*	1.92	3.18
UWR steelhead	0.88	0.92	1.00	1.00	1.88	0.92	1.13	1.39	1.37	1.69
LCR steelhead	0.80	0.91	1.00	1.00	0.80	.091	*N/A*	*N/A*	1.53	2.71
CR chum salmon	1.04	1.04	1.00	1.00	1.04	1.04	*N/A*	*N/A*	0.88	0.88
SR sockeye salmon*	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**

* Because the extremely low abundance of Snake River sockeye salmon, a meaningful life cycle analysis could not be conducted. However, the risk of extinction for this ESU is undoubtedly very high.
N/A indicates that, while some sub-basin analyses has been conducted, an aggregate analysis for the entire ESU has not been completed to date. Results for Snake River ESUs are in bold text.

[1] Low represents assumption that hatchery-origin natural spawners have been 80% as effective as wild spawners historically.
[2] High represents assumption that hatchery-origin natural spawners have been 20% as effective as wild spawners historically.
[3] Low represents estimation of juvenile survival improvement based on a comparison of PATH retrospective and prospective (A2) results.
[4] High represents estimation of juvenile survival improvement based on a combination of PATH and SIMPAS results.
[5] Low represents the low 1980-to-1999 lambda estimate multiplied by the low survival improvement estimate, raised to the power of 1/mean generation time.
[6] High represents the high 1980-to-1999 lambda estimate multiplied by the high survival improvement estimate, raised to the power of 1/mean generation time.
[7] Low represents the lowest estimate of needed survival improvement (Appendix A of 2000 FCRPS biological opinion, including preliminary 2000 and projected 2001 returns for index stocks) divided by the high estimate of the expected survival improvement.
[8] High represents the highest estimate of needed survival improvement (Appendix A of 2000 FCRPS biological opinion, including only final returns through 1999) divided by the low estimate of the expected survival improvement.

5. ENVIRONMENTAL BASELINE

The purpose of this section is to identify "the past and present effects of all Federal, State, or private activities in the action area, the anticipated effects of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the effect of State or private actions which are contemporaneous with the consultation in process" (50 CFR § 402.02, definition of "effects of the action"). These factors affect the species' environment or critical habitat in the action area. The factors are described in relation to the action area biological requirements.

5.1 Description of Action Area

The action area relative to both juvenile and adult Columbia basin salmonids is the part of their habitat that is affected by USBR project operations. The action area is best defined as the farthest upstream point at which smolts enter (or adults exit) the Snake River and Columbia River (at and below its confluence with the Snake River) to the farthest downstream point at which smolts exit (or adults enter) the migration corridor. In the Snake River, the area translates to immediately below Hells Canyon Dam or wherever an occupied tributary stream meets the Snake River below Hells Canyon Dam, to the confluence of the Snake and Columbia rivers. In the Columbia River, the action area begins at its confluence with the Snake River or wherever a tributary stream meets the Columbia River downstream of its confluence with the Snake River. Although the actual upstream extent of the action area varies among ESUs, in all cases the action area extends downstream to the farthest point (the Columbia River estuary and nearshore ocean environment) at which listed salmonids are influenced by USBR project (water management) operations. While the farthest downstream effects of the proposed action are not fully understood, the effects of the proposed action are likely minimal in the estuary and near ocean.

5.2 Biological Requirements in Action Area

To some degree, each of the 12 ESUs considered in this opinion reside in, or migrate through, the action area. Biological requirements during these life history stages are obtained through access to essential features of critical habitat. Essential features include adequate 1) substrate (especially spawning gravel), 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) migration conditions (58 FR 68546 for Snake River salmon and 65 FR 773 for all other Columbia River basin salmonids).

The essential features of each habitat type (juvenile rearing areas, juvenile migration corridors, areas for growth and development to adulthood, adult migration corridors, and spawning areas) are described in detail in Section 5.2.1 of the FCRPS 2000 Biological Opinion.

5.3 General Factors Affecting Species' Environment in Action Area

The general factors affecting the species' environment in the action area are described in the 2000 FCRPS Biological Opinion; these factors include hydrosystem, habitat, hatchery, and harvest effects, as well as the effects of natural conditions.

5.4 Specific Factors Affecting Species' Environment in the Action Area

5.4.1. Geographic Baseline

The Snake River basin upstream of Lower Granite Reservoir encompasses 103,200 square miles in the states of Idaho, Oregon, Nevada, Washington, and Wyoming. Historically, the Snake River basin upstream of Lower Granite Dam was an important watershed for anadromous salmonids (see Section 4 of the 1999 USBR Biological Opinion [NMFS 1999]), however, these fish were cut off from much of their historical ranges by hydroelectric projects and irrigation impoundments during the first half of the 20th century. Finally, between 1958 and 1967, the construction of the Hells Canyon Complex excluded anadromous salmonids from hundreds of miles of remaining habitat in the Snake, Boise, and Payette rivers and other tributaries. The construction of Dworshak Dam (completed in 1973) on the North Fork Clearwater River further reduced the range of these fish in the Snake River basin.

5.4.2. Hydrologic Baseline

The general hydrologic conditions applicable to this consultation remain as described in NMFS' 1999 Biological Opinion (NMFS 1999), Section V (incorporated by reference). This section discusses this year's specific hydrologic conditions that affect the status of listed species in the action area.

The water supply for the 2001 is expected to be very low. Flows throughout the Columbia basin are expected to approach the lowest ever recorded. To illustrate the severity of the current drought, the average January through July runoff of the Snake River at Lower Granite Dam is 29.7 Maf (NOAA 2001). This year's estimate is 14.1 Maf, 47% of average. For purposes of this biological opinion we use the period from April 1931 through March 1932 as a surrogate for streamflow conditions likely to be experienced during the period covered by this biological opinion. Figure 5-1 compares the simulated streamflow conditions that would have occurred at Lower Granite Reservoir from April 1931 through March 1932 under current water development conditions to the 50-year average (1929-1978). The data have been arranged to coincide with the period covered by this biological opinion (April through March).

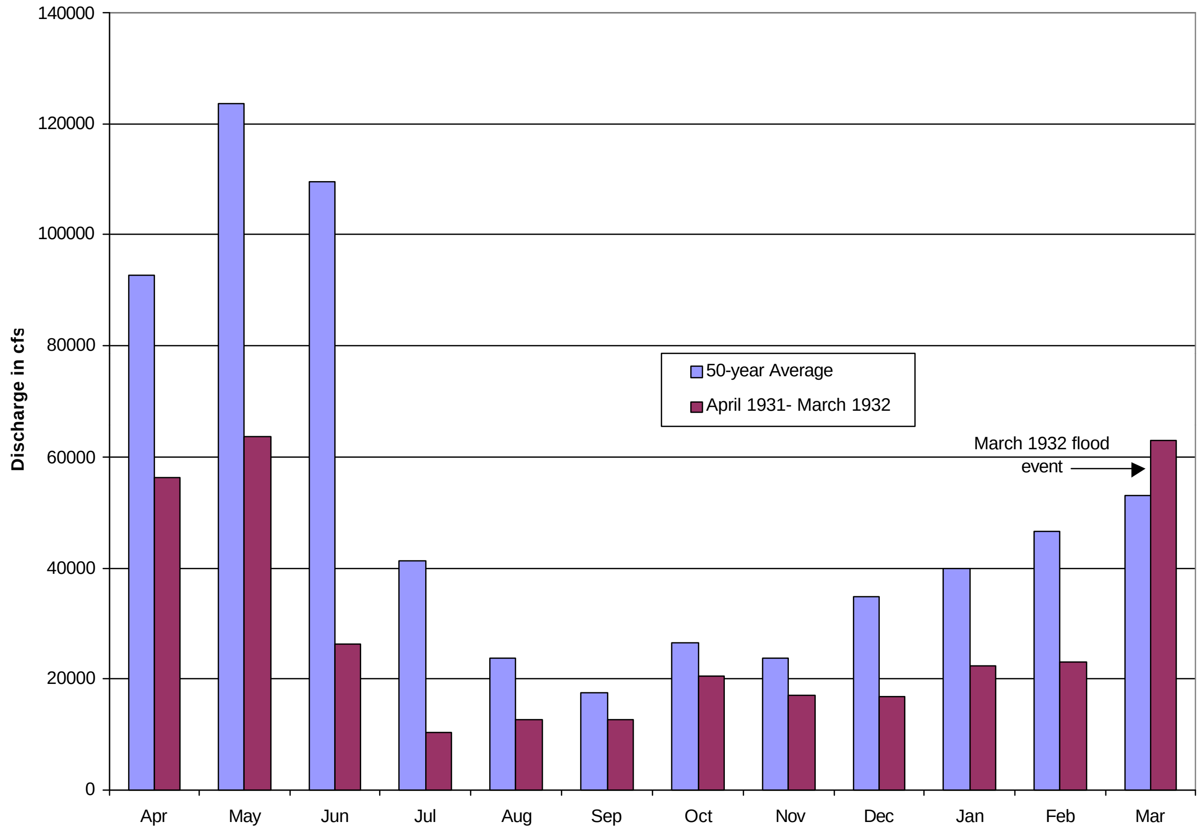

Figure 5-1. Comparison of simulated streamflows at Lower Granite Dam over a 50-year average (1929 through 1978) and the perod from April 1931 through March 1932. Source: BPA (2000) HYDSIM model run 00FSH33wo, November 21, 2000 with the estimated effects of USBR project operations removed (USBR 2001).

There are several reasons we have selected 1931 as a surrogate for 2001's hydrologic condition. The National Weather Service River Forecast Center's April final forecast estimates April through July runoff volume to be 1.9 Maf at Brownlee Reservoir and 10.0 Maf at Lower Granite Reservoir in 2001. The estimated April through July runoff volume in 1931 was 2.22 Maf at the location of Brownlee Reservoir and 10.8 Maf at Lower Granite Reservoir (BPA 1993). Streamflows in 1931 followed a normal shape with low summer and early fall flows. Thus, we consider 1931 to be the best year in the available record to represent the likely hydrologic conditions in the Snake and Columbia rivers through the summer if current below average precipitation conditions persist. From October through March, streamflows in the basin tend to be low, dominated by groundwater discharges, and become more responsive to recent precipitation events. Actual streamflows are more likely to vary substantially from the 1931 surrogate during these six months.

Current water storage conditions in the USBR's upper Snake River basin reservoirs are generally below average, although some reservoirs are currently well above 30-year averages for this time of year (e.g., American Falls Reservoir is currently full, 118% of average). A comparison of the systemwide storage observed in 2001 and in two recent drought years is presented in Table 5-1.

Table 5-1. Comparison of March 1 reservoir storage in acre-feet for various upper Snake River basin reservoirs for 1992, 1994 and 2001. Source: USBR 2001

Reservoir	**1992**	**1994**	**2001**
Boise System	251,758	594,492	471,446
Cascade	372,078	413,309	366,569
Deadwood	57,568	101,965	93,022
Owyhee	144,194	458,441	293,286
Warm Springs	23,491	113,815	61,043
Beulah	16,517	38,015	28,391
Bully Creek	11,332	18,883	16,926
Unity	18,579	15,127	5,411
Phillips	24,897	47,921	29,409
Minidoka/ Palisades	2,969,000	3,678,000	2,841,000
Little Wood	14,908	25,928	16,699
Total	3,906,314	5,507,890	4,225,203

5.4.3. Water Quality Baseline

5.4.3.1 Water Quality Upstream of the Hells Canyon Complex

Water quality in most of the upper Snake River is under the authority of the states of Idaho and Oregon under a framework provided by the Clean Water Act (CWA). The states promulgate water quality standards for specific physical and chemical parameters to provide suitable conditions to support, among other uses, cold water fisheries. Section 303(d) of the CWA requires states to identify and develop a list of waters for which water quality is inadequate to fully support designated beneficial uses. The states must develop water quality management plans, or total maximum daily loads (TMDLs), to define pollutant reductions necessary to bring the water body into compliance with water quality standards. The TMDL for the Snake River from where the Snake River intersects the Idaho-Oregon border (RM 409) to immediately upstream of the Snake River's confluence with Salmon River (RM 188) is under joint development by the Idaho Department of Environmental Quality (IDEQ) and the Oregon Department of Environmental Quality (ODEQ).

Based on information presented in the Draft Sub-Basin Assessment for the Snake River-Hells Canyon TMDL (IDEQ and ODEQ 2001), primary fishery-related water quality problems in the Snake River upstream of Hells Canyon Dam include dissolved oxygen, nutrients, sediment, mercury, and temperature.[6] The sources of these pollutants are diverse: municipal and industrial waste, urban runoff, agriculture land and water use, confined-animal feeding operations, reservoir operations, and other land use activities like mining, timber harvest, road construction, and river channelization (IDEQ 1997; IDEQ 2001 and ODEQ 2001).

5.4.3.2 Interactions with the Hells Canyon Complex

Brownlee, and to a lesser extent, Oxbow and Hells Canyon reservoirs, serve as sinks for deposition of sediments and nutrients entering the area from the upper Snake River and its tributaries. Idaho Power Company preliminary data suggest that high nutrient loads entering Brownlee Reservoir, in combination with the slack-water environment created by the existence of Brownlee Reservoir, result in excessive algae growth within the reservoir. The resultant algae (and any other suspended organic material) settles out of the water column in the transition zone (that area of the reservoir between the upstream riverine reach and the downstream lake-like reach of the reservoir). Over the course of the summer the decomposition of this organic material on the reservoir's bottom results in an increasing volume of anoxic water which eventually reaches the turbine intakes at Brownlee Dam (Haas 1965; Ebel and Koski 1968; Myers 1997). At such time, typically late-summer through fall, anoxic water is exported from Brownlee Reservoir and travels downstream through Oxbow and Hells Canyon dams. Dissolved oxygen concentrations between 2 and 5 mg/l can occur immediately downstream of Hells Canyon Dam (Myers and Pierce 1999; Idaho Power Company unpublished data [see Figure 5-2]). Ebel and Koski (1968) also reported dissolved oxygen concentrations downstream of Brownlee Dam of less than 5 mg/l from August through October in 1963. Dissolved oxygen levels apparently equilibrate (attain 100% saturation) within 20 miles of Hells Canyon Dam (Randolph 2000). Such biological processing is a common trait of eutrophic reservoirs.

Water quality upstream of the confluence of the mainstem Snake River and the Salmon River is regulated by the states of Idaho and Oregon under a framework provided by the CWA. The states promulgate water quality standards for specific physical and chemical parameters to provide suitable conditions for the support of beneficial uses. IDEQ and ODEQ are cooperating in the development of a TMDL for five 303(d)-listed segments of the Snake River from the Idaho-Oregon border to the confluence with the Salmon River (RM 409 to188). Stakeholders

[6]Water quality standards for temperature typically consider only maximum temperature thresholds above which the water body is considered "impaired." Alterations to the thermal regime of a body of water, in terms of timing, can also have serious negative impacts to anadromous fish and other aquatic organisms.

representing point and non-point sources, environmental groups, as well as representatives of Federal and state agencies, participate in the TMDL process through a Public Advisory Team (PAT). USBR is a regular participant in the PAT. One of these segments begins at Hells Canyon Dam (RM 247) and extends down to RM 188 and is, therefore, within the action area. ODEQ lists this segment under section 303(d) of the CWA for exceedences of Oregon's mercury and temperature standards. IDEQ has not listed this section of the Snake River pursuant to 303(d).

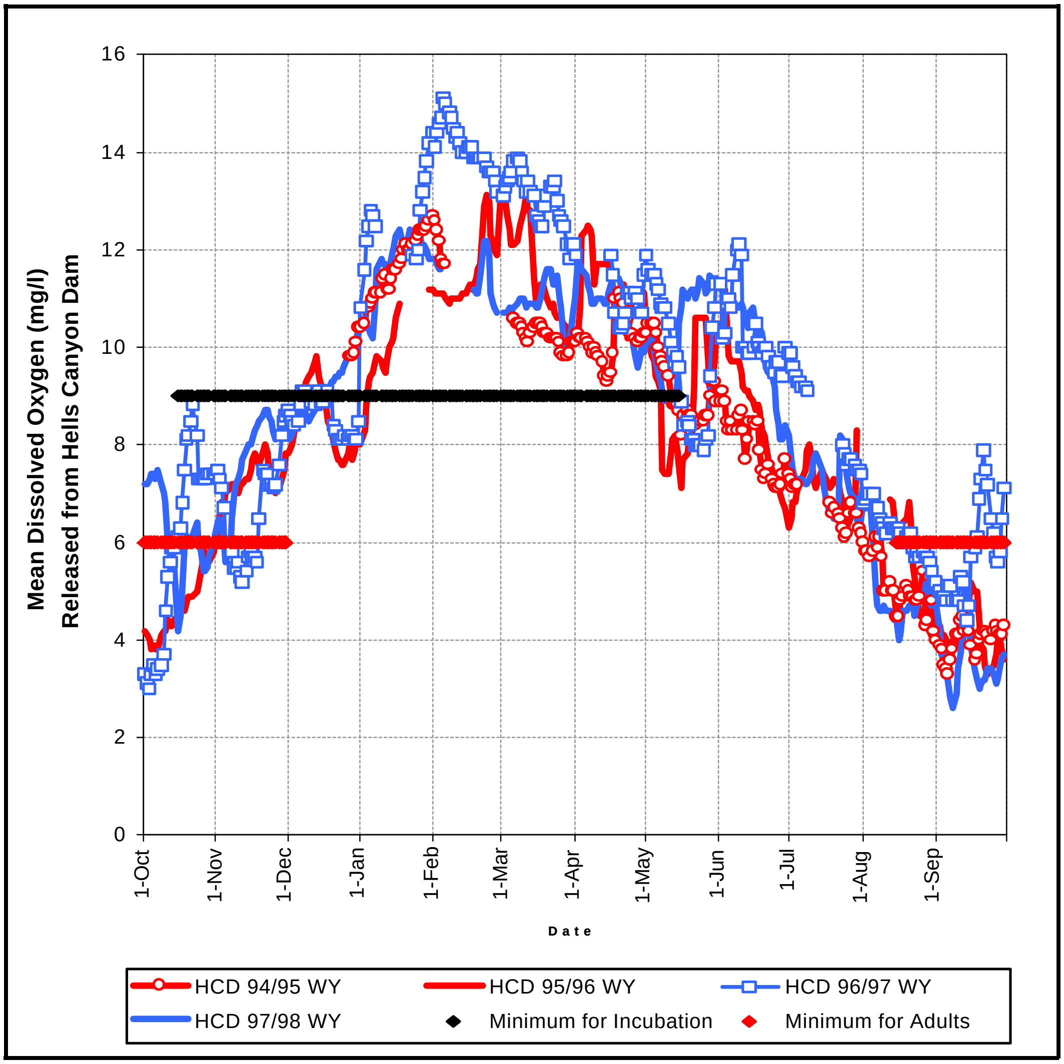

Figure 5-2. Daily mean dissolved oxygen (mg/l) levels in water released from Hells Canyon Dam (October 1994 to September 1998 and incubating (9 mg/l) and juvenile and adult (6 mg/l) oxygen requirements for anadromous fish. Source: Idaho Power Company - preliminary, unpublished data.

6. EFFECTS OF PROPOSED ACTION

NMFS has determined that because the operation of these projects affects the quality, quantity, and timing of water flowing in the Snake and Columbia rivers, the action area, for the purposes of evaluating the effect of these operations on ESA-listed Columbia River basin salmon and steelhead, is best defined as the Snake River at Hells Canyon Dam downstream to the Columbia River plume and nearshore ocean environment.

6.1 Hydrologic Effects

NMFS has determined that the survival of juvenile outmigrants is affected by streamflows (NMFS 2000).[7] Juvenile salmon and steelhead survive and return as adults at higher rates under outmigration conditions of higher, cooler, and more turbid streamflows. Also, Columbia River chum salmon spawning below Bonneville Dam may be affected by reduced streamflows during spawning and incubation. NMFS has therefore established flow objectives at several locations in the Columbia basin (Table 6-1). These objectives do not represent optimal conditions, nor are they considered 'hard constraints' which must be achieved at all times or in all years. Rather, NMFS' flow objectives are designed to guide management decisions about the optimal use of available water for the benefit of listed anadromous stocks. The flow objectives have been set at flows above which the observed improvements in survival with increases in flow diminish, or at beneficial flow levels that are generally achievable for most of the migration in most years with currently available water supplies and project authorities.

Table 6-1. Seasonal flow objectives (in kcfs) and planning dates for the mainstem Columbia and Snake rivers.

	Spring		Summer	
Location	**Dates**	**Objective**	**Dates**	**Objective**
Snake River at Lower Granite Dam	4/03 - 6/20	85 - 100 [1]	6/21 - 8/31	50 - 55 [1]
Columbia River at McNary Dam	4/10 - 6/30	220 - 260 [1]	7/01 - 8/31	200
Columbia River at Priest Rapids Dam	4/10 - 6/30	135	NA	NA
Columbia River at Bonneville Dam	11/1-emergence	125–160 [2]	NA	NA

[1] Objective varies according to water volume forecasts (see below).
[2] Objective varies based on actual and forecasted water conditions.

[7] More recently, the Independent Scientific Advisory Board (ISAB 2001) reviewed Dreher et al. 2000 and other more recent information on flow augmentation.

A principal effect of the proposed action is modified streamflows (depletions and changes in timing) through project storage operations and diversion, loss, and consumption incurred in irrigating project lands.[8]

The USBR (2001) has estimated that its projects provide irrigation water to a total of almost 1.6 million acres in the upper Snake River basin. About 605,000 acres receive all or most of their water from the USBR (termed “full service project lands”) and about 986,000 acres receive part of their water from the USBR (termed “supplemental lands”). About 4.9 Maf are diverted by USBR facilities each year. About 2.7 Maf of this annual diversion is from stored water. The remainder is derived from natural flows. The USBR estimates that crops consume about 1.6 Maf of this diverted water annually and that Snake River streamflows are reduced by the same amount (Table 6-2).

Table 6-2. Annual irrigated acreage, diversions, and water consumption at the USBR’s upper Snake River basin projects. Source: USBR 2001, Table 4-1.

Snake River	**Acres**	**Diversions** (acre-feet)	**Consumptive Use** [1] (acre-feet)
USBR Full Service Project Lands	605,000	—	1,040,600
Supplement Lands: Equivalent USBR Acres [2]	325,000	—	559,000
Totals	**930,000**	**4,890,000**	**1,600,000**

1. Total consumption estimated at 1.72 acre-feet per equivalent acre served (USBR 2001).
2. The 986,000 private acres receive about one-third of their water supply from USBR storage resulting in 325,000 equivalent acres (USBR 2001)

Documents provided by the USBR (2000a) during consultation leading to the 2000 FCRPS Biological Opinion estimated total USBR-caused Snake River basin streamflow depletions at about 3.8 Maf, reported in the July 27, 2000 draft of that opinion. In that analysis the USBR (2000a) overestimated crop water consumption from diverted water (2.33 acre-feet/acre) and made a simplifying assumption that all water consumed at USBR-served acreage was attributable to USBR operations. USBR’s Supplemental Biological Assessment (2001) adjusts crop consumptive use for antecedent soil moisture and growing season precipitation (0.61 feet of moisture), and more accurately quantifies the number of acres of lands served by USBR storage. The USBR considers the estimates presented in Table 6-2 to be the best scientific information currently available.

Using average monthly storage change data from 1979 through 1999 and estimated consumptive use and return flows, the USBR estimated that its proposed operation would have the greatest

[8] Estimating the streamflow effects of USBR upper Snake projects is complicated by the fact that these projects are but one aspect of water use in a highly developed basin with concomitant effects of other water uses, many of which predate USBR’s developments and most of which would exist with or without USBR’s projects. This analysis attempts to define USBR-caused effects as accurately as possible given available scientific information. The broader hydrologic effects of Snake River basin water development are discussed in Sections 6.1.1.1 and 7.

depletive effects on streamflows in the spring, with lesser depletions in the fall and winter, and net increases in streamflows in the summer (Table 6-3).

Table 6-3. Distribution of net USBR streamflow depletions (in cfs) from the Snake River basin for a recent 21-year period (1979 through 1999). Source: USBR 2001.

Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
8,764	18,472	11,328	-6,865	-11,128	-7,794	92	2,874	2,605	1,928	2,882	3,811	1.6 Maf

The likely effects of the USBR's proposed action in any given year vary depending on hydrologic conditions (e.g., wet, dry or average years) and reservoir storage conditions. For example, in a year when reservoirs are lower than average going into the storage season (November through June), storage activities would have a greater effect on streamflows during the storage season than those shown in Table 6-3. As described in Section 5.4.2, 2001 is a very low water year. The specific conditions expected this year would result in effects of the proposed action this year that differ from those averaged over a longer time frame (e.g., Tables 6-2 and 6-3).

First, over a 21-year record (1979–1999), water deliveries from USBR storage averaged about 2.7 Maf annually, leaving over 3.3 Maf in carryover storage. With the low runoff expected in 2001, the USBR (Peterson and Rigby, USBR, pers.comm. with Brown and Domingue, NMFS, April 10, 2001) estimates that as much as 4 Maf or more may be delivered from storage this year. This is because with the current low water conditions, USBR's customers will have decreased access to natural flows and will make greater use of water held in USBR storage facilities to meet their needs. The additional drafting necessary to meet this anticipated increased demand for stored water would have effects on end-of-season reservoir storage contents. This likely outcome would have effects on subsequent fall and winter flows (see Section 6.1.2).

In addition to increased reliance on stored water to meet irrigation demands, low water conditions can result in a failure to refill USBR project reservoirs. The USBR (Peterson and Rigby, USBR, pers.comm. with Brown and Domingue, NMFS, April 10, 2001) estimates that its reservoirs will miss refill by about 1.2 Maf this year.

To estimate the likely hydrologic effects of its projects from April 2001 through March 2002, the approximate period covered by this biological opinion, USBR simulated the hydrologic effects of operating its projects under the hydrologic conditions that existed from April 1931 through March 1932 (see Section 5.4.2 for an explanation of this surrogate). This "low year" analysis provides a somewhat different picture of hydrologic effects likely to occur during the period covered by this biological opinion (Table 6-4).

Table 6-4. Distribution of simulated net USBR streamflow depletions (in cfs) from the Snake River basin for the April 1931 through March 1932 hydrologic conditions under current USBR project configuration and operations. Source: USBR 2001.

Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
8,837	3,045	-6,649	-16,027	-10,499	-5,095	1,578	1,895	3,031	2,732	3,168	9,782*	-0.27 Maf

* March 1932 data includes a flood event in eastern Oregon captured by Owyhee Dam. A more appropriate value to use may be the average value of 3,811 cfs (see Table 6-3).

The 270 kaf of water that would be contributed to the system by USBR operations in this period would come from stored water. The BOR analysis assumes a constant value for crop water consumption and also assumes that all water not consumed by crops returns to the system. In this simulation, a substantial amount of stored water would be delivered to meet crop needs (~4.1 Maf), and the reservoir storage volume at the end of the period would be substantially lower (~2.16 Maf) than the storage volume at the beginning of the period (Table 6-5). That is, irrigation operations through October 2001 are expected to result in a substantial decrease in storage volume whereas the increased volume of water diverted, together with the assumed return flows, result in a net increase in streamflow volume over the 12-month period.

This anticipated storage deficit has potential effects that would extend beyond the period covered by this biological opinion. Assuming the existing operations of these projects does not greatly change, the USBR would store all available water until the reservoirs fill or irrigation demand requires that water be drafted to meet demand; conditions that are typically achieved by late June. Thus, flows in the Snake River downstream from Hells Canyon Dam in April through June of 2002 are likely to be more greatly affected by storage activities at upstream USBR projects to replenish water delivered to meet irrigation demands during the period covered by this opinion.

Table 6-5. Simulated total end of month USBR Snake River basin reservoir storage volume (in Maf) for the April 1931 through March 1932 hydrologic conditions under current USBR project configuration and operations. Source: USBR 2001.

Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Period Δ
5.71	5.46	4.61	3.12	2.09	1.60	1.69	1.97	2.28	2.57	2.86	3.55	-2.16

We consider the effects of the proposed action on both average conditions (Table 6-3) and low water conditions expected in 2001 (Table 6-4) in our analysis of likely hydrologic effects.

6.1.1 Irrigation Season Streamflow Effects

Using the monthly depletions shown in Tables 6-3 and 6-4 and applying them to the anticipated streamflow conditions at the flow objective sites listed in Table 6-1 suggests the following streamflow effects of the proposed action for the April through September 2001 time frame (Table 6-6).

Table 6-6. Estimated flows (kcfs) at each flow objective location from April – September 2001 with and without the proposed action for two hydrologic scenarios: continued low hydrologic conditions (1931) and improved hydrologic conditions (50-year average). Sources: 'With proposed action' flows are BPA HYDSIM model run 00FSH33wo flows for either 1931 or the period average. 'Without proposed action' flows remove USBR's estimated depletions (Table 6-4).

Lower Granite Dam						
	Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1931 w/o Proposed Action	56.4	63.8	26.3	10.4	12.7	12.7
1931 with Proposed Action	47.5	60.8	32.9	26.5	23.2	17.8
Percent Change	-16%	-5%	25%	153%	83%	40%
Average w/o Proposed Action	92.7	123.5	109.8	41.2	23.9	17.5
Average with Proposed Action	83.9	105.0	98.5	48.0	35.0	25.3
Percent Change	-9%	-15%	-10%	17%	47%	44%
McNary Dam						
	Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1931 w/o Proposed Action	134.0	177.9	158.6	110.6	122.8	83.1
1931 with Proposed Action	125.2	174.9	165.2	126.6	133.3	88.2
Percent Change	-7%	-2%	4%	15%	9%	6%
Average w/o Proposed Action	224.1	306.2	292.6	186.0	150.2	91.8
Average with Proposed Action	215.3	287.8	281.3	192.9	161.3	99.6
Percent Change	-4%	-6%	-4%	4%	7%	8%

Table 6-6. Cont.

Bonneville Dam						
	Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1931 w/o Proposed Action	153.6	192.2	172.0	121.3	130.2	90.2
1931 with Proposed Action	144.8	189.1	178.7	137.3	140.7	95.3
Percent Change	-6%	-2%	4%	13%	8%	6%
Average w/o Proposed Action	243.8	317.8	306.5	195.2	157.4	99.1
Average with Proposed Action	235.0	299.3	295.2	202.1	168.5	106.8
Percent Change	-4%	-6%	-4%	4%	7%	8%

Most of the snow likely to contribute to spring/summer 2001 runoff is on the ground now and is included in NOAA's runoff forecast. NMFS therefore anticipates that streamflow conditions are more likely to resemble the 1931-1932 surrogate than the long-term average. Side by side comparisons of streamflows at the flow objective sites are shown in Figures 6-1 through 6-3.

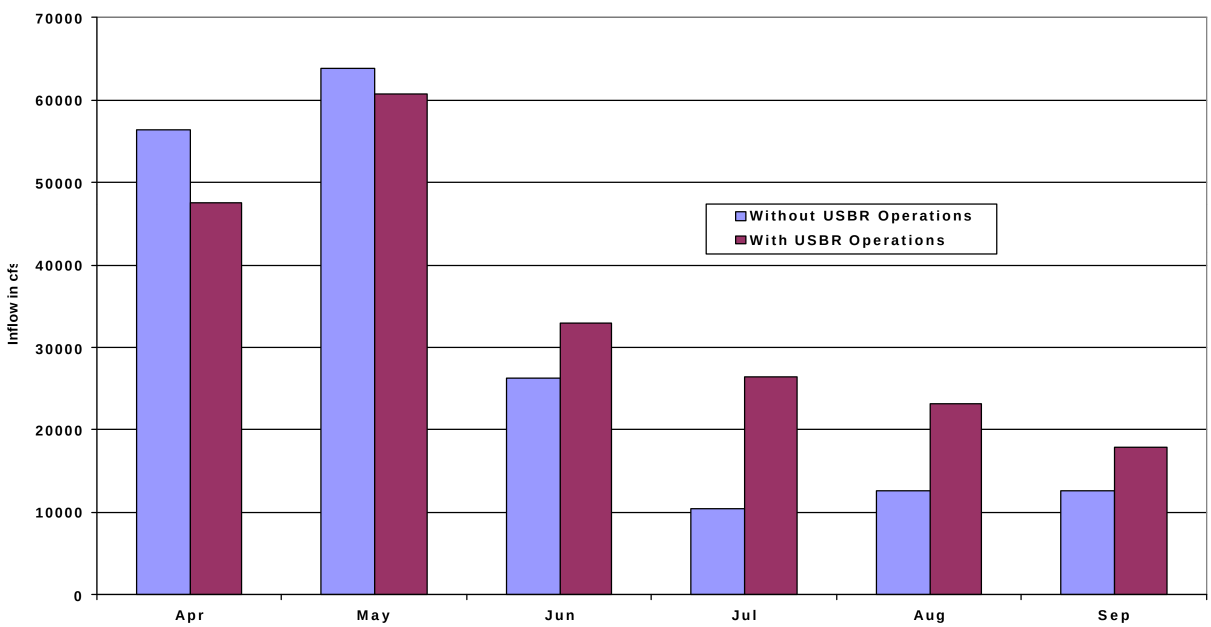

Figure 6-1. Estimated streamflows from April through September 2001 at Lower Granite Dam with and without USBR operations. Sources: 'With USBR operations' flows are simulated 1931 streamflows under 2000 FCRPS Biological Opinion operations from BPA HYDSIM model run 00FSH33wo, Nov. 21, 2000. 'Without USBR operations' remove USBR's estimated depletions.

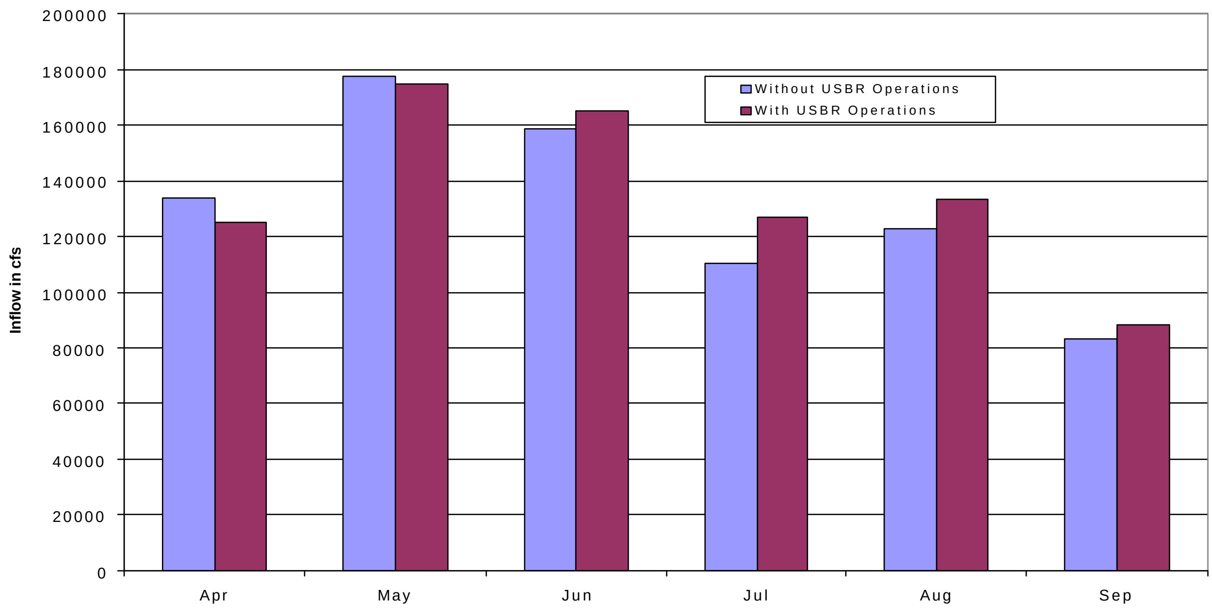

Figure 6-2 Estimated streamflows from April through September 2001 at McNary Dam with and without USBR operations. Sources: 'With USBR operations' flows are simulated 1931 streamflows under 2000 FCRPS Biological Opinion operations from BPA HYDSIM model run 00FSH33wo, Nov. 21, 2000. 'Without USBR operations' remove USBR's estimated depletions.

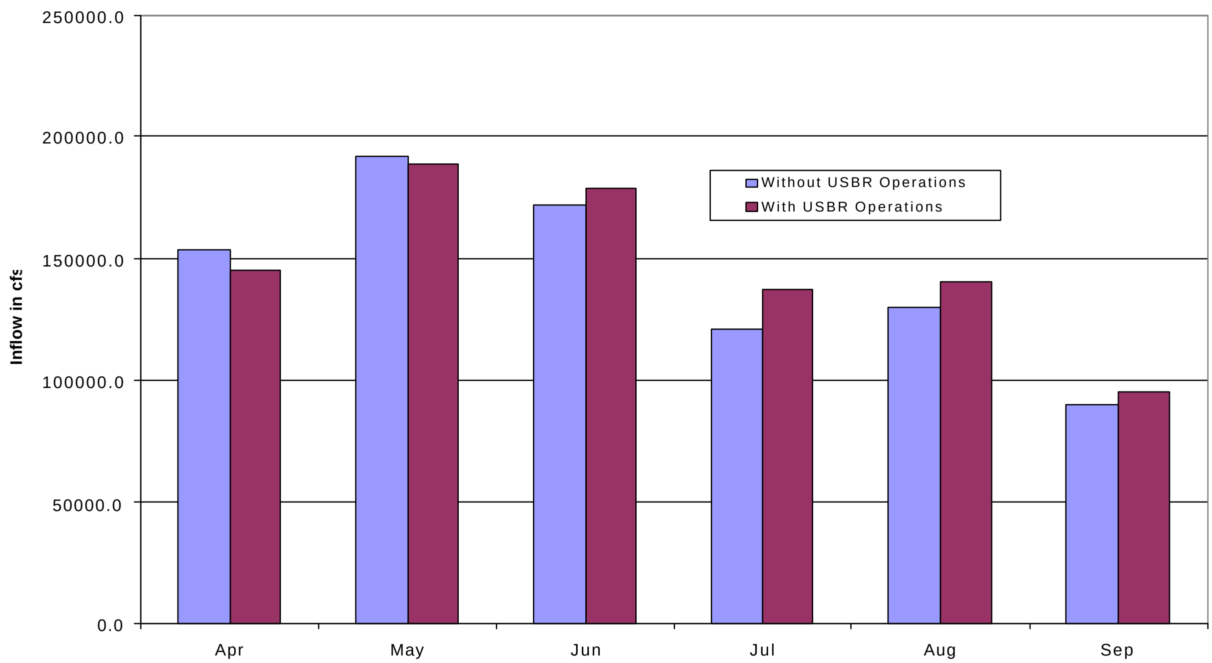

Figure 6-3. Estimated streamflows from April through September 2001 at Bonneville Dam with and without USBR operations. Sources: 'With USBR operations' flows are simulated 1931 streamflows under 2000 FCRPS Biological Opinion operations from BPA HYDSIM model run 00FSH33wo, Nov. 21, 2000. 'Without USBR operations' remove USBR's estimated depletions.

In this very dry year, the flow objectives (Table 6-1) are unlikely to be met from April through August with or without the proposed action. The proposed action would increase the deficits between the likely flows and the flow objectives in April and May (Table 6-4), while decreasing the deficits in June, July, and August. The action would also increase streamflows in September. The proposed action has the strongest relative effects on streamflows at Lower Granite Dam, diminishing in the downstream direction. For example, the USBR's operations reduce simulated April streamflows by 16% at Lower Granite and only 4% at McNary and Bonneville.

The analysis presented above assumes that all water not consumed at USBR project lands returns to the Snake River. In the highly developed Snake River basin, however, other water users would likely capture some, perhaps most, of this return flow and some of the water not consumed by the proposed action would be lost to the river via non-tributary groundwater and other losses (see Section 7). The analysis presented above is intended to estimate the effects of USBR's projects absent other water developments in the basin and should not be construed to depict the likely actual streamflow outcomes if USBR's project storage and delivery operations were curtailed.

6.1.1.1 Indirect Effects

Indirect effects of a proposed action include effects "that are caused by the proposed action and are later in time, but are still reasonably certain to occur" (50 CFR § 402.02). Through its operations, USBR facilitates irrigation operations not directly associated with its projects. For example, USBR routinely augments flows in the Boise River to facilitate canal diversions through USBR diversion dams. This operation does not affect USBR project water consumption. It does, however, improve access to natural flows facilitating additional streamflow depletions by natural flow water users.

Return flows from USBR water deliveries increase water availability throughout the irrigation season. In low water years like this one, the higher late summer streamflows facilitated by USBR's return flows allow a longer period of access to natural flows than would otherwise occur. This increased availability likely increases overall water use in the basin.

Throughout much of the USBR's project area, water which is not consumed or returned to the river via surface returns infiltrates through the soil and enters the Snake basin plain aquifer. Groundwater pumpers in Idaho remove about 7.5 Maf of water from the aquifer annually (USBR 1998). The Snake basin plain aquifer discharges about 3.5 Maf to the Snake River annually in the area of Thousand Springs, Idaho. Groundwater irrigation withdrawals reduce the flow at these springs and capture some of the return flows from USBR's operations. Groundwater augmentation resulting from USBR's operations likely increase overall groundwater use in the basin.

These indirect effects of the proposed action are undefined and difficult to quantify. They are of interest, however, because they occur during the irrigation season, the period when USBR and other Federal project operators provide flow augmentation to enhance streamflow conditions to benefit outmigrating salmon. These effects are difficult to distinguish from and are, therefore, captured in the cumulative effect of water use in the Snake River basin discussed in Section 7.

6.1.2 Fall and Winter Streamflow Effects

At the end of the 2001 irrigation season the USBR estimates that between 500 kaf and 850 kaf of active storage will remain in its reservoirs. By contrast, on average, over 3.3 Maf is carried over in USBR reservoirs following the irrigation season. Following the irrigation season, the USBR operates its projects to maximize storage, within the limits imposed by flood control requirements. This suggests that the 2001-2002 fall and winter streamflow effects of the proposed action will be substantially greater than the average 21-year volumes presented in Table 6-3. USBR reservoir operations in a low water year like 1931-1932 would result in somewhat higher streamflow depletions (Table 6-7).

Table 6-7. Estimated average monthly USBR-caused Snake River streamflow depletions (in cfs) from October through March for a 21-year record and the 1931-1932 low flow year. Source: USBR 2001.

	Oct	Nov	Dec	Jan	Feb	Mar
1979-1999	92	2,874	2,605	1,928	2,882	3,811
1931-1932	1,578	1,895	3,031	2,732	3,168	9,782*

* March 1932 data includes a flood event in eastern Oregon captured by Owyhee Dam.

Using these estimates of monthly streamflow reductions during the October through March time period and the range of likely streamflow conditions for the same period provides the following estimates of potential effects of the proposed action (Table 6-8). This analysis presents the range of flows considered likely under current hydrologic conditions. In this analysis, 1931 conditions represent the lowest streamflows expected and the long-term average conditions are indicative of the highest streamflows considered likely. Extreme events could occur and may result in flows outside these bounds.

Table 6-8. Estimated flows at Bonneville Dam from October 2001 through March 2002 with and without the proposed action for two hydrologic scenarios: continued low hydrologic conditions (1931) and improved hydrologic conditions (50-year average). Sources: 'With proposed action' flows are BPA HYDSIM model run 00FSH33wo flows for either 1931 or the period average. 'Without proposed action' flows remove USBR's estimated depletions (Table 6-7).

	Oct	Nov	Dec	Jan	Feb	Mar
1931 w/o Proposed Action	103.3	122.3	112.8	102.5	101.5	167.8
1931 with Proposed Action	101.7	120.4	109.8	99.8	98.3	158.0
Average w/o Proposed Action	114.7	133.5	153.7	190.0	178.7	177.7
Average with Proposed Action	114.6	130.7	151.0	188.1	175.9	173.8

It is not possible to accurately predict October through March streamflow conditions at Bonneville Dam at this time because river flows during this time period are highly responsive to precipitation events and because major upstream reservoirs are operated in response to real-time energy and flood control needs. USBR reservoir storage deficits at least as large as those shown on Table 6-5, however, are very likely to occur and therefore actual streamflow depletions from October 2001 to March 2002 are likely to be at least as large as those estimated for the 1931-1932 surrogate (Table 6-7).

6.1.3 The USBR's Contribution to Flow Augmentation in 2001

Assuming a total USBR contribution to the augmentation program of about 112 kaf or 56,000 cfs-days suggests that even with the anticipated USBR contribution to the augmentation program, streamflows are not likely to meet NMFS' flow objectives. If this amount were used in a single month, it would increase monthly average streamflows by slightly less than 2,000 cfs. NMFS will use water made available through the USBR's efforts judiciously, at times and at rates calculated to provide the greatest possible improvements in juvenile migrant survival.

The 1999 USBR Biological Opinion contained a detailed discussion of the flow augmentation program which also includes reservoir storage operations described in the 2000 FCRPS Biological Opinion and the institutional framework in which the USBR conducts its portion of the program. That discussion (NMFS 1999) is hereby incorporated by reference. The most current analysis of flow augmentation probabilities was undertaken by USBR in February 1999 (USBR 1999b). Analyzing conditions for a 62-year period (1928-1989), the USBR estimated how frequently it could provide flow augmentation under varying water conditions, as follows:

Level of Flow Augmentation	Percentage of Time Met	Number of Years Met
427,000 acre-feet	82	51
300,000 acre-feet	92	57
250,000 acre-feet	95	59

In three years of the simulation, the amount of flow augmentation provided was less than 250,000 acre-feet. In the poorest year (1988), only 179,000 acre-feet were provided.

Certain aspects of the program described in NMFS (1999) no longer apply. Both the Milner Agreement regarding rates of water delivery and the agreement between IPC and BPA regarding shaping of USBR water deliveries at the Hells Canyon Complex have expired. In addition, the estimates in the preceding table assumed all powerhead space was available for flow augmentation. As noted in Section 3.1, the USBR has determined that powerhead space will not be available for flow augmentation during the term of this opinion.

6.1.4 Facilities Maintenance Activities

The USBR has proposed three facility repair operations during the period covered by this biological opinion. Only the proposed repair work on Jackson Lake Dam has any potential hydrologic effect. The proposed maintenance is anticipated to draw the reservoir down 10.5 feet. The draft could release as much as 300,000 acre-feet, assuming the reservoir is full when drafting begins, although this is considered unlikely given extant hydrologic conditions. The actual amount of water released will likely be less. The proposed action is to conduct this drafting during fall 2001. It is thus likely that any water released from Jackson Lake would be captured in Palisades or American Falls reservoirs and the action would have no measurable effects within the portion of the Snake River occupied by listed fish.

6.2 Water Quality Effects

Operation of the 10 USBR projects in the upper Snake River basin considered in this supplemental biological opinion results in water storage, streamflow depletions, and irrigation return flows. These activities have both positive and negative effects on water quality in the mainstem Snake River and major tributaries, including the Boise, Payette, Weiser, Owyhee, Malheur, Burnt, and Powder rivers. Primary effects are increases in nutrient and suspended sediment loads, and changes in the thermal regimes of the riverine and reservoir environments (USBR 2001).

The low dissolved oxygen levels downstream of the Hells Canyon Complex during the late summer and fall is a result of human activities in the Snake River basin and the Hells Canyon Complex reservoirs (see Section 5.4.3). Whether, or to what extent, USBR projects provide a material contribution to these conditions has not been determined at this time. Determining the effect of USBR projects on water quality problems in the Snake River downstream of the Hells Canyon Complex is complicated because most USBR facilities are located far upstream, and because reaches of free flowing river and other impoundments occur between these projects and the Hells Canyon Complex. In addition, USBR project effects are mixed with natural background conditions, climatic fluctuations, and the effects of other activities in the watershed including operation of the Hells Canyon Complex, dry land farming and grazing, urban storm runoff, municipal and industrial waste water discharges, and irrigation return flows from lands not served by the USBR (USBR 2001). The limited scientific and commercial data available at this time limits NMFS to a qualitative evaluation of the effects of USBR projects on water quality parameters important to listed salmon and steelhead.

The USBR is gathering water quality data from a number of sites in cooperation with other state and local entities to define water quality effects of tributary inflows, including project return flows, on conditions in the mainstem Snake River (USBR 2001). This information, when evaluated through the states' TMDL planning process, will provide information with which to better define the effects of these projects on water quality in future ESA consultations.

6.2.1 Specific Effects of USBR Upper Snake River Projects

6.2.1.1 Water Temperature

The USBR storage reservoirs and operations likely result in some seasonal shift in the thermal regime (cooler spring temperatures and warmer late summer and fall temperatures). Increased summer flows and groundwater return flows resulting from USBR operations likely decrease summer temperatures in the upper Snake River basin (USBR 2001). In addition, the relative temperature effect of USBR projects and their operation diminishes in a downstream direction as other projects (e.g., the Hells Canyon Complex and FCRPS dams) and additional tributaries influence temperature in the action area. Thus, water temperatures in the action area will likely range from a little better to a little worse than conditions that would exist without the effects of the proposed USBR project operations. It does not appear that the USBR operation, by itself, will be a major determinant of temperature in the action area downstream of Hells Canyon Dam.

6.2.1.2 Sediment

The sediment budget of the Snake River upstream of the Hells Canyon Complex has been altered by USBR projects and operations (IDEQ and ODEQ 2001). Specifically, larger-sized sediments (sand, gravels, and cobbles) will be captured by USBR storage facilities and loads of smaller-sized particles (silt) will be altered due to USBR operations. However, the effect of USBR projects and operations on the sediment regime in the action area will be small because of the effect of intervening projects such as the Hells Canyon Complex.

6.2.1.3 Nutrients and Dissolved Oxygen

The storage and release of water from USBR projects does not directly affect nutrient loads. Some USBR projects may also reduce downstream nutrient concentrations much as the Hells Canyon Complex does (Section 5.4.3.2). However, increased irrigated acreage as a consequence of USBR operations in the Snake River basin will, as an indirect effect, contribute to nutrient loads, particularly phosphorus, in the Snake River upstream of the Hells Canyon Complex. However, based on state water quality status reporting and 303(d) lists, it appears that nutrient loads associated with the ongoing operation and maintenance of USBR projects in the upper Snake River Basin have little potential to impact ESA-listed anadromous salmonids in the lower Snake River downstream from the Hells Canyon Complex.

Preliminary data relating to the dissolved oxygen problem below Hells Canyon Dam (see Section 5.4.3) are currently under review. To date, no conclusions have been reached regarding the extent of the problem or the viability of potential solutions, and conclusions are not expected to be finalized during the term of this biological opinion. Furthermore, there has been no determination to date on whether or to what extent operation of the USBR projects contributes to the problem.

6.2.1.4 Total Dissolved Gas

Because USBR projects will store runoff during the winter and spring, when flood events in excess of generation capacity are most likely to occur at downstream hydroelectric projects, the operation of these projects reduces the quantity of water spilled (and resultant generation of supersaturated levels of TDG) at the Hells Canyon Complex (Myers et al.1999) and FCRPS dams (EPA et al. 2000). Thus, USBR operations would likely reduce TDG levels in the action area relative to what would occur without the proposed operation of USBR upper Snake River projects in a high runoff year. In the low runoff conditions anticipated for 2001 this potential benefit of USBR operations is likely to be small to nonexistent.

6.2.1.5 Mercury

Mercury problems in the Snake River are believed to be a result of historic gold mining and milling operations, particularly in the Jordan Creek area of the Owyhee River basin upstream of Owyhee Reservoir. Storage of water and sediment in Owyhee Reservoir may inhibit downstream transport of mercury from past mining operations, and thereby result in some reduction of mercury loads available for bioaccumulation in the river system downstream of the Hells Canyon complex (USBR 2001; IDEQ and ODEQ 2001). Thus, the USBR's proposed action likely reduces the amount of mercury in the action area.

6.2.2 Development of Total Maximum Daily Loads

Several TMDLs for the mainstem Snake River and its major tributaries are already completed and the remainder are scheduled for completion between 2001 and 2006 (see Section 7.3). TMDL implementation plans will define discharge targets and responsibilities of point and non-point source contributors in achieving water quality goals. The USBR participation in TMDL planning for the Snake River above the Hells Canyon Complex during 2001 will provide better information for assessing and addressing water quality in critical habitat. Eventually, the TMDL process should provide long-term improvements in the water quality of the Snake River and may provide benefits to salmon and steelhead.

The USBR's continued actions to assist in pollution reduction efforts by irrigation system operators and others should reduce nutrient loads in the upper Snake River by reducing the volume and improving the quality of irrigation return flows. Common actions to reduce the volume of irrigation return flows include installation of pumpback and reuse projects and automation of canals to reduce system waste. Installation of sedimentation basins and wetland treatment systems has been a primary means of reducing nutrient concentrations associated with irrigation drainage. Other steps USBR has taken to manage, or assist in the management of, nutrients include monitoring to measure nutrient removal efficiencies of treatment systems, fencing livestock out of reservoir areas, installing treatment systems to improve the quality of storm runoff from recreation area on shorelands, stabilizing reservoir banks (preventing shoreline erosion and associated internal phosphorus loading), and providing financial assistance for construction of a wastewater storage facility to permit irrigation reuse of all municipal effluent in lieu of discharge to the Payette River (McClendon 2001). NMFS expects that USBR's continued actions to reduce nutrients will result in incremental long-term improvements to water quality in the Snake River.

6.3 Biological Effects

The biological requirements of listed salmon and steelhead in the action area are described in Section 5.2.1 of the 2000 FCRPS Biological Opinion. The primary effects of the proposed action are on water quantity and water quality in the action area. Therefore, the following sections describe the effects of the USBR's proposed operation on water quantity and water quality in the juvenile and adult migration corridors, in spawning and rearing areas, and in areas used for growth and development to adulthood (the Columbia River estuary and plume).

6.3.1 Effects on Biological Requirements for Water Quantity

Reducing water quantity in the mainstem Snake and Columbia rivers and the nearshore ocean environment can potentially result in both sub-lethal effects (reduced habitat quality, delayed migration, and increased energy expenditures) and lethal effects (dewatered redds, stranding, increased risk of predation, and loss of energy reserves) for salmon and steelhead.

6.3.1.1 Adult Migration Corridor

Travel time and energy expenditures of upstream migrants are lower in reservoirs than in free-flowing rivers. At the mainstem projects, adults may be delayed in the tailrace or adult collection channel, but once they begin to ascend the ladder, delays are minimal (see Section 6.2.4.1 in the 2000 FCRPS Biological Opinion). Under the RPA described in the 2000 FCRPS Biological Opinion, delay will be minimized by operating to meet water velocity and flow criteria at fishway entrances and channels. The net effect of delay at mainstem dams, combined with faster passage through reservoirs, is a median travel time at least as fast with dams in place as with no dams. Changes in water quantity attributable to the USBR operation are not expected to adversely affect these adult passage conditions in the lower Snake or lower Columbia rivers.

6.3.1.2 Spawning Areas

The USBR's operations to fill storage reservoirs at the end of the irrigation season are expected to deplete flows in the lower Snake River by 1.6 kcfs in October and by 1.9 kcfs in November when fall chinook salmon are spawning (Table 6-4). Idaho Power Company operates the Hells Canyon Complex during this period to provide stable flows of 9 to 13.5 kcfs, protecting fall chinook salmon redds from dewatering as a result of winter load-following operations (Idaho Power Company 1991). If low precipitation conditions persist through the fall of 2001, the USBR's proposed action may result in Brownlee Reservoir inflows of less than 9 kcfs during the fall chinook spawning period. If this occurs, and IPC does not draft Brownlee to maintain the minimum spawning flow, then spawning flows of less than 9 kcfs may result downstream of the Hells Canyon Complex. Thus, if October and November 2000 resemble 1931, the USBR's proposed action may result in some suitable spawning habitat being unavailable for fall chinook spawning in the lower Snake River. Given the IPC operation, the USBR's proposed action is unlikely to affect the biological requirements of spawning fall chinook in 2001.

Columbia River chum salmon spawn in the mainstem approximately two miles below Bonneville Dam during November through early January. The USBR estimates that its proposed action will result in net flow depletions downstream of Bonneville Dam of approximately 1.9 to 3.0 kcfs from November through January (Table 6-4). If conditions during spawning are similar to November 1931 through January 1932, and total discharge at Bonneville Dam is in the range of 120.4 kcfs during November to 99.8 kcfs during January (Table 6-8), the below-Bonneville spawning aggregation will not have access to the mainstem habitat. That is, flows less than 125 kcfs will not surmount the local hydraulic control points. Spawning habitat in Hamilton and Hardy creeks, which are seasonal streams, is wetted by local precipitation. However, the mouth of Hamilton Creek is just below one of the hydraulic control points for the mainstem area so access to Hamilton Creek, and to habitat in its man-made side channel, Hamilton Springs, could also be limited by USBR's proposed 2001 operation.

NMFS expects that actual conditions during November 2001 through early January 2002 will be somewhere between the worst-case scenario described above and average conditions, also shown in Table 6-8. The closer that conditions are to those seen in 1931-32, the more water will have to be released from storage in the upper Columbia River basin to provide spawning habitat for chum salmon below Bonneville Dam. The need to use water from upper Columbia basin reservoirs (while USBR's flow depletions continue unchanged) would reduce the amount of water available for spring migrants.

Tule-type chinook salmon from the LCR ESU have been observed spawning once (October 1999) in the mainstem area below Bonneville Dam (Hymer 1999). By definition, tule fall chinook would spawn in early fall 2001, when Bonneville discharge is expected to range from 102 kcfs (if 2001 is like 1931) to 115 kcfs (average October condition). Because these fish are excluded from spawning in the below-Bonneville area during most years by seasonal low flows (e.g., average flows are 115 kcfs during October, per Table 6-6), they would also be excluded under USBR's proposed action.

The remaining ESUs do not spawn in the mainstem Snake or Columbia rivers. Therefore, the USBR's proposed action will not affect these species' biological requirements for water quantity in spawning areas.

6.3.1.3 Rearing Areas

Snake River spring/summer chinook and sockeye salmon and steelhead rear in tributary systems to the mainstem Snake River and do not have biological requirements for rearing habitat within the action area. Fall chinook salmon rear in the mainstem Snake River migration corridor. Effects of the proposed action on biological requirements during this life-history stage are therefore discussed in Section 6.3.1.4 below.

Columbia River chum salmon may rear briefly near tributary spawning areas, but will quickly emigrate to the estuary. The USBR's proposed action is not expected to affect biological requirements for water quantity or quality in rearing areas for this ESU. Effects on biological requirements during emergence are discussed in Section 6.3.1.4 (Juvenile Migration Corridor).

Juveniles from the UCR spring-run chinook and steelhead ESUs and MCR, LCR, and UWR steelhead ESUs are predominately yearling migrants. As described above for SR spring/summer chinook and sockeye salmon and steelhead, they do not have biological requirements for rearing habitat within the action area. Some juvenile chinook from the LCR and UWR ESUs are subyearling migrants but these enter the action area below The Dalles Dam. NMFS has not set flow objectives for rearing habitat in the mainstem Columbia River specifically to benefit these ESUs.

6.3.1.4 Juvenile Migration Corridor

The analysis conducted in Section 6.1 indicates that the primary effects of the operation of USBR upper Snake River projects on water quantity and the timing of flows during 2001 will be to elevate summer and decrease late fall, winter, and spring flows. Juvenile CR chum salmon emerge from the below-Bonneville spawning area from February through May. Flow depletions below Bonneville Dam are expected to be approximately 3-4 kcfs (Table 6-4) during the portion of the emergence and emigration period considered in this opinion (i.e., through March 2002). Depending on total Bonneville discharge, all flow depletions, combined with tidal fluctuations, can lead to stranding and entrapment of emerging chum. As long as the USBR upper Snake depletion is limited to approximately 3-4 kcfs, it would rarely, by itself, make a sufficient difference at Bonneville Dam to harm chum salmon. Also, as noted in Section 6.3.1.2, to the extent that reservoirs in the upper Columbia basin are drafted to compensate for these flow depletions, that water would not be available for late spring migrants.

The proposed action is expected to benefit summer migrants (SR fall chinook salmon) by providing net flow accretions to the Snake River in June, July, and August 2001 (6.6 kcfs, 16.0 kcfs, and 10.5 kcfs, respectively), when juvenile fall chinook will be migrating (USBR 2001). Previous research has identified strong, positive relationships between the survival of subyearling migrants and flow, temperature, and turbidity (NMFS 2000).

For spring migrants, no comparable juvenile flow/survival relationships have been seen in recent studies, but there is a strong and consistent inverse relationship between travel time and flow (i.e., travel time increases as flows decrease [NMFS 2000]). Also, several studies (Petrosky 1992; Raymond 1988; Petrosky and Schaller 1992) have indicated a relationship between river conditions during the spring outmigration and the rate at which adults return, with years of higher river flow producing higher rates of adult returns than low-water years. As shown in Table 6-6, under the USBR's proposed operation, flows at Lower Granite are expected to range from 33 to 61 kcfs during April through June 2001. Inspection of estimated streamflows at Lower Granite Dam, developed using BPA's HYDSIM hydrologic model (BPA 2000), indicates that flows have been lower in only six years over the 50-year water record.

Studies carried out over a subset of that period, 1964 to 1994, indicate that the smolt-to-adult returns (SARs) of 2001 outmigrants are likely to be extremely low. In the two years with flows similar to those projected for 2001 (i.e., 1973 and 1977), SARs for wild SR spring/summer chinook salmon and steelhead were 0.01 or less (NMFS 2000). In the Snake River, per-project survival rates of yearling chinook salmon were 0.35 and 0.55 in 1973 and 1977, respectively. Passage facilities and conditions at the dams have improved since the 1970s and inriver survival during 2001 will probably be somewhat higher than estimated for 1973 or 1977. However, until per-project survival rates exceed 0.75, cumulative inriver survival to below Bonneville Dam will be less than 0.10.

The trends described above, extended travel times and low SARs during extremely low flow years, pertain directly to SR spring/summer chinook salmon and steelhead and are also likely to pertain to SR sockeye salmon, another spring, yearling migrant. NMFS expects that the biological requirements of yearling chinook salmon and steelhead from the UCR, MCR, LCR, and UWR ESUs may also be adversely affected by USBR's proposed flow depletions in the upper Snake River basin, although relative effects on these ESUs diminish with distance downstream, as mainstem flows become dominated by inputs from the upper Columbia River.

6.3.1.5 Areas for Growth and Development to Adulthood

The USBR's proposed action may have effects on rearing habitat in the Columbia River plume that in turn affect the growth and survival of yearling and subyearling migrants. However, the evidence for these relationships is largely inferential and is the subject of ongoing research.

6.3.2 Effects on Biological Requirements for Water Quality

The qualitative analysis conducted in Section 6.2, and the conservative ESA principle of resolving uncertainty in favor of the listed species, indicates that the primary potential effect of the operation of USBR projects upstream of the Hells Canyon Complex on water quality in the action area may be some unquantified contribution to decreased dissolved oxygen levels (i.e., in the reach within 20 miles of Hells Canyon Dam) during late summer and fall. The effects of low dissolved oxygen levels (3 to 6 mg/l) on pre-spawning adult salmon are not well understood (ODEQ 1995) but may include, depending upon the duration of the exposure to these conditions,

negative impacts such as avoidance, delayed migration, reduced swimming speeds, reduced fecundity, reduced spawning condition, and death. The effects of low dissolved oxygen levels on early life history stages of salmonids are well known. At levels below 8 mg/l, the size of fish at emergence is reduced and the survival of juveniles declines. Similarly, below 5-6 mg/l, survival of embryos is often low (ODEQ 1995). Thus, to the extent that dissolved oxygen levels are reduced, death of eggs or reduced fitness of fry may occur.
The following subsections describe likely effects of water quality conditions in juvenile and adult migration corridors, spawning and rearing areas, and areas for growth and development to adulthood. As previously noted, because USBR projects are located substantially upstream of the Hells Canyon Complex, and because of extended reaches of free flowing river and intermediate impoundments, whether and to what extent that USBR projects contribute to nutrient and dissolved oxygen, sediment, and temperature problems in the Snake River downstream of Hells Canyon Dam has not been determined.

Generally, during the term of this action, USBR participation in TMDL planning processes will improve information available to assess and address water quality concerns in critical habitat below Hells Canyon Complex. This action will thereby support long-term attainment of water quality standards supportive of salmonid biological requirements.

6.3.2.1 Adult Migration Corridors

State water quality standards for temperature are exceeded in the lower Snake and Columbia rivers when summer migrating salmon and steelhead are present (EPA et al. 2000; IDEQ and ODEQ 2001). However, as described in Section 6.2.2.1, the effect of USBR project operations on water temperature is likely small.

Minimum dissolved oxygen concentrations of at least 6 mg/l are required to meet the biological requirements of migrating adult salmon and steelhead. Adult SR fall chinook salmon migrate from mid-August through late November when dissolved oxygen concentrations as low as 3 mg/l have been observed immediately downstream of Hells Canyon Dam (see Section 5.4.3.2). Individual A-run SR steelhead also migrate in this reach during late summer. Thus, to the extent that dissolved oxygen concentrations are reduced below 6 mg/l, pre-spawning adults from these ESUs are likely to be affected as described in Section 6.3.2.

None of the other ESUs migrate within 20 miles of Hells Canyon Dam, so the USBR's proposed action will not affect biological requirements for water quality in their adult migration corridors.

6.3.2.2 Spawning Areas

Only SR fall chinook salmon spawn in the mainstem Snake River within 20 miles of Hells Canyon Dam, the reach where low dissolved oxygen levels can occur (see Section 6.2.2.3). The likely effects of low dissolved oxygen concentrations (< 6 mg/l) on spawning adults and incubating eggs[9] within this area is described in Section 6.3.2. Between 1991 and 1998, USFWS and Idaho Power Company counted 700 SR fall chinook salmon redds in the mainstem Snake River between Lower Granite Reservoir and Hells Canyon Dam (Idaho Power Company unpublished data). Of these, a total of 95 (13.6%) were located within 20 miles of Hells Canyon Dam. This is NMFS' best estimate of the proportion of SR fall chinook salmon redds likely to be adversely affected by any low dissolved oxygen levels observed in 2001.

The remaining ESUs do not spawn in the mainstem Snake or Columbia Rivers. Therefore, these stocks will not be affected by the water quality in these spawning areas below Hells Canyon complex.

6.3.2.3 Rearing Areas

Minimum dissolved oxygen concentrations of at least 6 mg/l are required to meet the biological requirements of rearing salmon and steelhead. Only SR fall chinook salmon rear in the mainstem Snake River within 20 miles of Hells Canyon Dam. However, based on seining efforts in the Snake River upstream of its confluence with the Salmon River (RM 188), it appears that juveniles have migrated from the reach prior to mid-August when low dissolved oxygen levels are likely to occur (Connor et al. 1997). Therefore, potential water quality conditions in the reach are not expected to adversely affect biological requirements for water quality in SR fall chinook salmon juvenile rearing areas.

The remaining ESUs do not rear in the mainstem Snake River within 20 miles of Hells Canyon Dam during the late-summer and early fall. Therefore, these stocks are not likely to be adversely affected by water quality in these areas during 2001.

6.3.2.4 Juvenile Migration Corridors

As noted in Section 6.3.2.3, migrating SR salmon and steelhead are unlikely to be found within 20 miles of Hells Canyon Dam in late summer and fall when low dissolved oxygen levels occur. Therefore, the potential water quality conditions of this reach are not likely to adversely affect biological requirements for water quality in the juvenile migration corridor of SR or other Columbia River basin ESUs.

6.3.2.5 Areas for Growth and Development to Adulthood

[9] Surface water dissolved oxygen concentrations are generally 3.0 mg/l greater than in the underlying gravels. In highly impacted spawning areas, this difference may be greater. Water velocity through the spawning gravels also influences the level of dissolved oxygen in the gravels. Thus, minimum dissolved oxygen concentrations of at least 9 mg/l in surface waters are generally needed to meet the biological requirements of incubating eggs (ODEQ 1995).

The USBR's proposed action is unlikely to affect the biological requirements of juveniles for water quality in the Columbia River estuary and plume.

7. CUMULATIVE EFFECTS

Cumulative effects, as defined in 50 CFR Section 402.02, include the effects of future state, Tribal, local, or private actions, not involving Federal activities, that are reasonably certain to occur within the action area (described in Section 1). Future Federal actions requiring separate consultations pursuant to Section 7 of the ESA are not considered here.

Future state, Tribal, local, and private actions have been previously described in the 2000 FCRPS Biological Opinion and the 1999 Supplemental USBR Biological Opinion. These descriptions are incorporated, by reference, into this biological opinion. In summary, the cumulative effects relevant to this biological opinion are streamflow depletions and water quality degradation. Streamflow depletion effects can be approximated by comparing the total effect of Snake River water development (Figure 7-1), and deducting the effects of USBR operations. The cumulative effects on water quality are discussed below. These non-Federal effects are expected to continue in 2001 except as discussed below. The remainder of this section describes activities that were not considered in those earlier biological opinions.

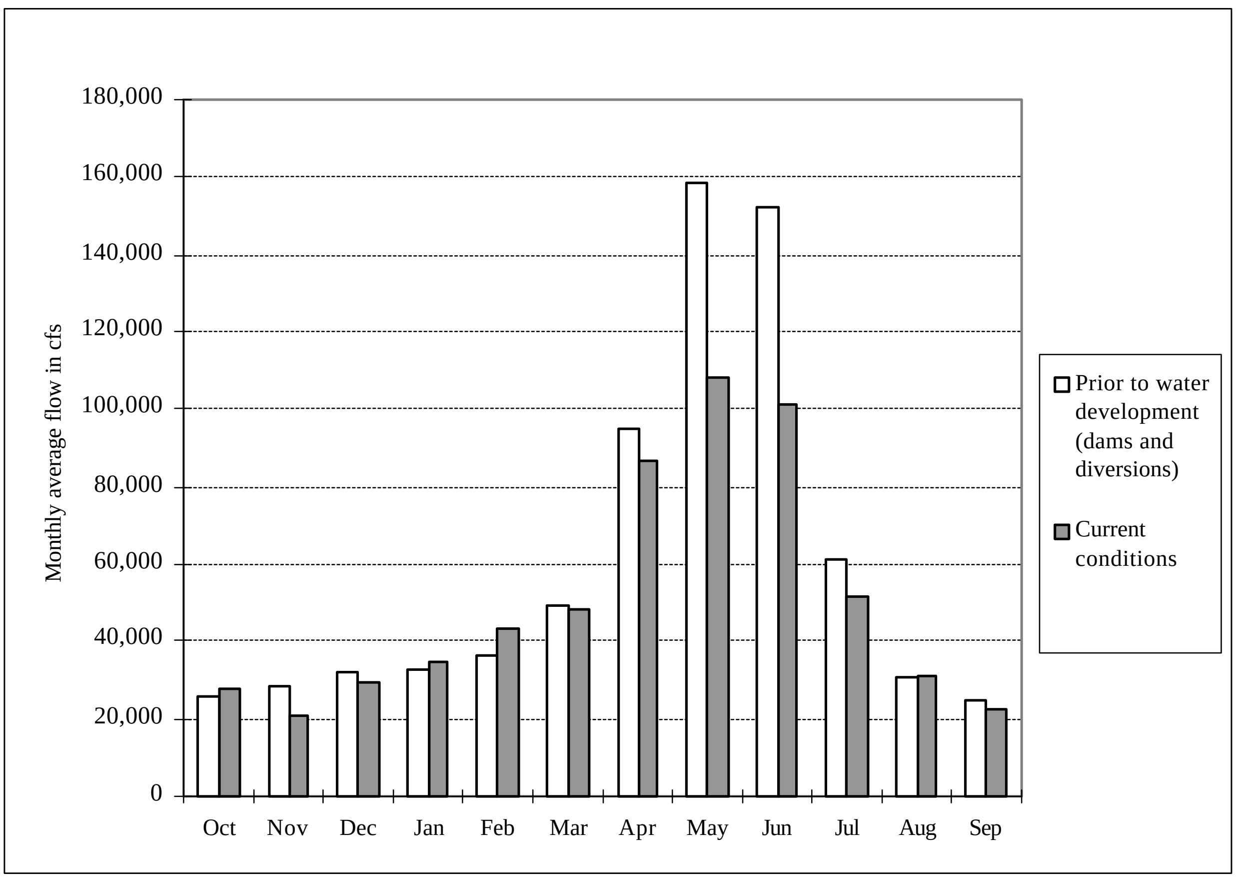

Figure 7-1. Effects of water development on Snake River mean monthly discharge at Lower Granite Dam based on a 50-year simulation (1929-1978). Source: USBR 1999a.

The amount of water consumed by irrigation varies widely depending on water availability and growing season moisture. Simulating operations under recent irrigation demand conditions, the USBR (1999) estimated total average annual streamflow depletions upstream from Brownlee Reservoir, including both Federal and non-Federal irrigation, at slightly less than 7 Maf.[10] Irrigation water consumption is likely to be less than average this year due to reduced availability and a power buy-back program being conducted by Idaho Power Company (See Section 7.1). In the similar runoff year of 1931, simulated streamflow depletion upstream from Brownlee Reservoir under current demand conditions (USBR 1999a) was 4.3 Maf.

7.1 Increased Flows Resulting From Idaho Power Company's Purchase of Energy From Agricultural Customers

Due to the low flows and the extremely high wholesale power costs expected in 2001, Idaho Power Company sought and was granted permission by the Idaho Public Utilities Commission to buy back energy from willing irrigation customers to reduce energy consumption in its service area. Idaho Power Company has aggressively pursued this program and the USBR estimates as an indirect consequence of this program approximately 35 thousand acres of irrigated lands will be removed from production this year. The USBR further estimates that the net result of buy-back will be an accrual of approximately 109 kaf of water to the Snake River. The estimated 109-kaf reduction in irrigation water demand as a result of Idaho Power Company's electrical demand buy-back program assumes that some of the water associated with the program would be diverted by other means and that a significant part of the electrical demand reduced by the program would, therefore, result in little water savings (USBR 2001). We consider the USBR's 109 kaf reduction to be a conservatively low estimate of the likely water savings.

Alternative energy sources (i.e., diesel generators) will likely be used by some irrigators to pump water. Any conserved water will likely accrue to summer streamflows at various points in the basin. However, if irrigation supply deficits occur as anticipated, then some fraction of the saved water could be diverted and put to use and consumed by others. Also, some fraction of the saved water would likely be captured in storage reservoirs. A large fraction of the buy-back program's water savings would occur downstream from most diversions and most of that water is expected to remain instream. Given the conservative assumptions used by the USBR in deriving this estimate of net water savings, and the limited opportunities for subsequent capture and use for a large share of the saved water, we consider 109 kaf a reasonable estimate of the total streamflow improvement above Brownlee Reservoir. This volume is expected to increase Snake River flows throughout the irrigation season (from approximately June through September), enhancing migration conditions for spring and summer migrants. Assuming the USBR can

[10]Water consumption is estimated as the total of water diverted from the stream minus return flows. In irrigation, water is lost through: crop consumption, conveyance losses (ditch losses), on-farm losses (water that does not reach the intended crop), and infiltration. In the upper Snake River basin's highly porous geology, much of the water that is lost through infiltration returns to the Snake River through shallow aquifers and does not contribute to streamflow depletions (although the timing of return flows differs from the timing of loss).

timely deliver as much as 112 kaf of flow augmentation water, a total of 221 kaf in streamflow enhancement may occur during the juvenile salmon outmigration season.

7.2 Snake River Basin TMDLs

Plans for achieving state water quality standards in the area encompassing the 10 USBR upper Snake Projects are being formulated through the TMDL process specified under Section 303(d) of the Federal CWA. The states of Idaho and Oregon are required to develop TMDLs for water quality-limited stream reaches on a schedule mandated by the Federal Court. The states have scheduled development of TMDLs on stream reaches impacted by operation of USBR projects in the upper Snake River basin (Table 7-1). Developing and implementing these TMDLs should result in long-term improvements in the water quality of the Snake River and may benefit Snake River salmon and steelhead in the action area. NMFS expects that, to the extent USBR projects and operations are identified in this process as contributing to the water quality baseline described in Section 5.4.3, the TMDL will specify actions by the USBR to address those effects.

Table 7-1. TMDL Schedule for Streams Impacted by USBR Project Return Flows in the Upper Snake Basin. Source: USBR 2001, Table 6-3.

IDAHO	**TMDL Target Completion Year**
Lake Walcott Subbasin	
Snake River - American Falls Dam to Lake Walcott (3 segments)	Approved 2000
Upper Snake - Rock Subbasin	
Snake River - Milner Dam to King Hill	Approved 2000
Middle Snake - Succor Subbasin	
Snake River - Swan Falls to Idaho/Oregon Border	2002
Succor Creek - Oregon Line to Snake River	2002
Lower Boise Subbasin	
Boise River - Barber Diversion to Snake River	Approved 2000
Payette Subbasin	
Payette River - Black Canyon Dam - Snake River	Approved 2000
Weiser Subbasin	
Weiser River - Galloway Dam to Snake River	2003
Upper Salmon Subbasin	
Snake River - Weiser to Brownlee Reservoir	2001
OREGON	**TMDL Target Completion Year**
Owhyee Basin	
Owyhee River - Mouth to Owyhee Reservoir	2006
Malheur Basin	
Malheur River - Mouth to Hog Creek	2003
North Fork Malheur River - Mouth to Beulah Reservoir	2003
Bully Creek - Mouth to Bully Creek Reservoir	2003
Willow Creek - Mouth to Pole Creek	2003
Powder Basin	
Burnt River - Mouth to Unity Reservoir	2005
Powder River - Mouth to Thief Valley Reservoir	2005
IDAHO - OREGON JOINT TMDL	**TMDL Target Completion Year**
Snake River - Hells Canyon	
Snake River - Idaho/Oregon Border to Upstream of the Salmon River	2001

Source: Idaho's and Oregon's 1998 303(d) Lists.

8. CONCLUSIONS

The analysis in the preceding sections of this biological opinion forms the basis for NMFS' conclusions as to whether the proposed action, the ongoing operation and maintenance of the upper Snake River USBR projects in 2001, satisfies the standards of ESA Section 7(a)(2). To do so, the USBR must ensure that their proposed action is not likely to jeopardize the continued existence of any listed species or destroy or adversely modify the designated critical habitat of such species. Section 4 of this opinion defines the biological requirements and the current status of each of the 12 listed salmon and steelhead ESUs in the Columbia River basin. Section 5 evaluates the relevance of the environmental baseline to each species' current status. Section 6 details the likely effects of the proposed action, both on individuals of the species in the action area and on the listed population as a whole. Section 7 considers the cumulative effects of relevant non-Federal actions reasonably certain to occur within the action area. On the basis of this information and analysis, NMFS draws its conclusions about the effects of the upper Snake River USBR projects in 2001 on species-level biological requirements and on the survival and recovery of the 12 listed salmon and steelhead ESUs.

The conclusions reached here are consistent with conclusions in NMFS' 1995 FCRPS Biological Opinion, NMFS' 2000 FCRPS Biological Opinion, and the Basinwide Salmon Recovery Strategy (Federal Caucus 2000) concerning the level of improvements needed across each ESU's life cycle to satisfy the requirements of ESA Section 7(a)(2). In particular, to meet the biological needs of listed salmonids for adequate flows and water quality in the lower Snake River, NMFS anticipated continuation and possible expansion of existing flow augmentation measures by the USBR's upper Snake River projects over the long term. At the same time, NMFS' expectations for flow augmentation for the long term acknowledge that in very low water years like 2001, the opportunities for significant flow augmentation volumes from the upper Snake River basin would be limited. When combined with the reductions in streamflow depletions anticipated by other water interests, the proposed action for 2001 will yield volumes of flow augmentation within the range expected by the USBR in a low water year such as this one.

In an effort to fulfill RPA 1.b. of the 1995 FCRPS Biological Opinion to "ensure a high probability of providing provision of that volume [427 kaf]. . . [and] secure additional amounts of water," the USBR is actively involved in the SRBA settlement negotiations, in part, to secure and enhance its mainstem flow augmentation program.

Finally, the efficacy of the USBR flow augmentation program relies upon the reasonable expectation that its releases will be coordinated with other hydropower operations on the Snake River. For example, the 1995 FCRPS Biological Opinion expected that the delivery of USBR flow augmentation water to the lower Snake River, pursuant to TMT recommendations, when it could best benefit the listed stocks in conjunction with additional volumes from Idaho Power Company's Brownlee Reservoir (see NMFS' 1995 FCRPS Biological Opinion, p. 101).

NMFS therefore concludes that the proposed action conforms with NMFS' expectations for the performance of the USBR's flow augmentation program when NMFS reached its 'no jeopardy' conclusion for the 1995 FCRPS Biological Opinion's RPA. The species-specific conclusions reached below are tied to this overarching finding.

8.1 Snake River Spring/Summer Chinook and Sockeye Salmon and Snake River Steelhead

8.1.1 Biological Requirements for Juveniles

These species, which are yearling spring outmigrants, do not rear in the action area but have biological requirements for adequate water quantity and quality in the migration corridor. As described in Section 6.3.1.4, the USBR's proposed operation to refill irrigation storage facilities will reduce the likelihood that flow objectives for adequate water quantity will be met. The USBR's proposed action includes a flow augmentation program that may provide some offsetting benefit. The biological requirements of juvenile spring migrants from the Snake River basin for water quality are not likely to be affected (Section 6.3.2.4).

8.1.2 Biological Requirements for Adults

These spring-run ESUs spawn in tributary systems rather than the mainstem Snake or Columbia river and therefore biological requirements for adequate water quantity in spawning areas will not be affected by USBR's proposed action (Section 6.3.1.2). However, individual A-run steelhead migrating within 20 miles of Hells Canyon Dam are likely to be affected by low dissolved oxygen levels (Section 6.3.2.1), though the extent to which USBR project operations contribute to such levels is unknown. The USBR's continued action in the TMDL planning process and otherwise to evaluate the extent of water quality effects from its operations, and those of cumulative effects, will provide a basis for developing measures to reduce these effects and is expected to benefit these stocks in the long term.

8.1.3 Conclusions for Snake River Spring/Summer Chinook and Sockeye Salmon and Snake River Steelhead

Based upon NMFS' consideration of the effects of the proposed action in the context of the effects of the environmental baseline and cumulative effects, and using the best science available, NMFS concludes that USBR's proposed operation for 2001 is not likely to jeopardize the continued existence of listed SR spring/summer chinook salmon, SR sockeye salmon, or SR steelhead or to destroy or adversely modify their designated critical habitats. This conclusion is further supported by measures for survival and recovery specific to other life stages for this ESU as per the 2000 FCRPS Biological Opinion.

While NMFS considered the expected adverse affect of USBR's operations in 2001 on juvenile migrants from these ESUs (the biological requirement for water quantity in the migration corridor will not be met), the operation in this year is consistent with the multi-year operation previously envisioned in the 1995 Biological Opinion. This conclusion is further supported by measures for survival and recovery specific to other life stages for these ESUs as per the 2000 FCRPS Biological Opinion. In addition, NMFS expects that conditions will be improved through the SRBA settlement negotiations.

8.2 Snake River Fall Chinook Salmon

8.2.1 Biological Requirements for Juveniles

Juvenile Snake River fall chinook salmon rearing in and migrating through the action area have biological requirements for adequate water quantity and quality. The USBR's proposed action will increase summer flows, which benefit this ESU (Section 6.3.1.4). In the cumulative effects section (Section 7.1), NMFS refers to Idaho Power Company's expected energy buy-back from willing irrigation customers and the expected accrual of approximately 109 kaf of water to the Snake River during the summer migration period. This action should also benefit juvenile SR fall chinook salmon migrants.

Juvenile SR fall chinook salmon are not expected to be present downstream of Hells Canyon Dam during the period when low dissolved oxygen levels occur (Section 6.3.2.3). The USBR's continued action in the TMDL planning process and otherwise to evaluate nutrient loads in the mainstem Snake River and its tributaries upstream of the Hells Canyon Complex will provide a basis for developing future measures to reduce any adverse effects.

8.2.2 Biological Requirements for Adults

Adult SR fall chinook salmon migrate through the lower Snake River during late August through November and have biological requirements for adequate water quantity and quality in the migration corridor. The USBR's proposed action could reduce the availability of suitable spawning habitat in October and November (Section 6.3.1.2). However, the Idaho Power Company operation should be sufficient to meet the needs of the number of spawning adults expected to return in 2001, therefore, this one-year operation is not likely to adversely affect the ESU.

Those individual SR fall chinook adults that migrate within 20 miles of Hells Canyon Dam are likely to be adversely affected to the extent that dissolved oxygen concentrations in that reach are reduced below 6 mg/l (Section 6.3.2.1 and 6.3.2.2). Similarly, incubating eggs and fry in this reach are likely to be fall chinook salmon adversely affected by low dissolved oxygen levels. The USBR's continued action to participate in TMDL planning processes to evaluate nutrient loads in the mainstem Snake River and its tributaries upstream of the Hells Canyon Complex will provide a basis for developing future measures to reduce any adverse effects. Ongoing actions to reduce nutrient loads entering the mainstem Snake River should likewise increase the likelihood of meeting the long-term biological requirements of this ESU for water quality.

8.2.3 Conclusions for Snake River Fall Chinook Salmon

Based upon NMFS' consideration of the effects of the proposed action in the context of the effects of the environmental baseline and cumulative effects, and using the best science available, NMFS concludes that the USBR's proposed operation for 2001 is not likely to jeopardize the continued existence of listed SR fall chinook salmon or to destroy or adversely modify their designated critical habitat. This conclusion is further supported by measures for survival and recovery specific to other life stages for this ESU as per the 2000 FCRPS Biological Opinion.

8.3 Columbia River Chum Salmon

8.3.1 Biological Requirements for Juveniles

The adverse effect of the USBR's proposed 2001 operation on the biological requirements of CR chum salmon for water quantity in the lower Columbia River rearing and juvenile migration corridor could be limited relative to the effects of hydrology (6.3.2.4).

Biological requirements for water quality of this late winter-early spring migrating ESU in the lower Columbia River will not be adversely affected by the USBR's proposed action.

8.3.2 Biological Requirements for Adults

Depending on several conditions, the USBR's proposed 2001 operation may adversely affect biological requirements of CR chum salmon for water quantity in spawning areas (Section 6.3.1.2). The potential for adverse effects on chum arises from the combined effects of weather and operation of other projects in the Columbia River basin. In the worse-case scenario (i.e., mainstem flows below Bonneville Dam less than 125 kcfs) adult chum salmon could be completely excluded from the mainstem spawning area due to the combined effects of these operations. If conditions during the November through early January spawning season are closer to average conditions, a smaller area of suitable habitat will be lost.

Biological requirements for water quality in the migration corridor (6.3.2.1) and spawning areas (6.3.2.2) of this ESU will not be adversely affected by the USBR's proposed action.

8.3.3 Conclusions for Columbia River Chum Salmon

Based upon NMFS' consideration of the effects of the proposed action in the context of the effects of the environmental baseline and cumulative effects, and using the best science available, NMFS concludes that the USBR's proposed operation for 2001 is not likely to jeopardize the continued existence of listed CR chum salmon or to destroy or adversely modify its designated critical habitat. This conclusion is further supported by measures for restoration of historical spawning habitat adjacent to the below-Bonneville spawning area as per the 2000 FCRPS Biological Opinion.

8.4 Other Columbia Basin Chinook Salmon and Steelhead ESUs

8.4.1 Biological Requirements for Juveniles

The biological requirements of juvenile UCR spring-run chinook salmon and steelhead, MCR steelhead, UWR chinook salmon and steelhead, and LCR chinook salmon and steelhead are similar to those described for spring migrants in the lower Snake River (Section 8.1.1). That is, the USBR's proposed action will reduce the likelihood that biological requirements for water quantity will be met, although the relative effect will be greater for the UCR and MCR ESUs than for UWR and LCR chinook salmon and steelhead. Although the effects of water development in the upper Snake River basin, including the proposed USBR action, will have a lesser effect on these stocks in the lower Columbia River, estuary and plume, it nevertheless occurs together with similar activities that reduce flows in the lower Columbia River. In the same way, the USBR flow augmentation program for 2001 will act to benefit these species. The USBR's proposed action is not likely to adversely affect biological requirements for water quality for juvenile migrants of these ESUs (6.3.2.4).

8.4.2 Biological Requirements for Adults

The biological requirements of adult UCR spring-run chinook salmon and steelhead, MCR steelhead, UWR chinook salmon and steelhead, and LCR chinook salmon and steelhead are also similar to, but diminished relative to, those described for adult migrants in the lower Snake River (Sections 8.1.2 and 8.2.2). Mainstem flows will be reduced during spring when individuals from these ESUs are in the action area.

The USBR's proposed action is not likely to adversely affect biological requirements for water quality for migrating and spawning adults of these ESUs (6.3.2.1 and 6.3.2.2).

8.4.3 Conclusions for Other Columbia Basin Chinook Salmon and Steelhead ESUs

Based upon NMFS' consideration of the effects of the proposed action in the context of the effects of the environmental baseline and cumulative effects, and using the best science available, NMFS concludes that the USBR's proposed operation for 2001 is not likely to jeopardize the continued existence of listed UCR spring-run chinook salmon and steelhead, MCR steelhead, UWR chinook salmon and steelhead, and LCR chinook salmon and steelhead or to destroy or adversely modify their designated critical habitat. This conclusion is further supported by measures for survival and recovery specific to other life stages for these ESUs as per the 2000 FCRPS Biological Opinion.

9. INCIDENTAL TAKE STATEMENT

This incidental take statement supplements the 2000 FCRPS Biological Opinion and therefore incorporates by reference any applicable incidental take statement measures from that document. In the course of this supplemental consultation, NMFS has identified an additional reasonable and prudent measure to further minimize the impact of the incidental take authorized by those opinions. Without altering the amount of incidental take previously authorized, the additional measure and its associated terms and conditions are as follows:

9.1 Reasonable and Prudent Measure

9.1.1 New Contracts for Water Stored in USBR Projects

Because the USBR's salmon flow augmentation program is heavily dependent on annual water rentals from Idaho's water rental pools, a variable and insecure source, the USBR shall not issue any new contracts to storage space or otherwise commit any uncontracted storage space provided by the projects covered by this biological opinion without further consultation.

9.1.2 Water Quality

USBR, in coordination with IDEQ and ODEQ in the TMDL planning process, should 1) prepare a water balance for the Snake River between Murphy and Weiser, including major tributaries, main stem pumping, and surface and ground water drainage from agricultural lands draining directly to the Snake River, (2) assist in cooperative monitoring of tributaries and return flows entering the Hells Canyon Complex, (3) work with operating entities on Reclamation projects to assist in developing TMDL implementation plans, and (4) assist irrigation system operators in implementing water quality improvement measures, as appropriate.

9.1.3 Document Outcomes of Flow Augmentation and Water-Saving Measures in 2001

The USBR shall document and report to NMFS the outcomes of this year's flow augmentation program and the estimated hydrologic consequences of water and energy conservation efforts undertaken this year by others. Considerable uncertainty exists with regard to the effectiveness of electrical energy demand reduction efforts and other measures (e.g., irrigation district drought management actions) in saving water in 2001. Such measures have the potential to increase streamflows at critical times to protect and enhance listed anadromous salmonids. It is therefore important to document both the outcome of the USBR's flow augmentation program in 2001 and the effect on streamflow of water and energy conservation efforts of others.

9.2 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the USBR must comply with the following terms and conditions, which implements the reasonable and prudent measure described above. These terms and conditions are non-discretionary.

9.2.1 New Contracts for Water Stored in USBR Projects

Prior to entering into any agreement to commit uncontracted storage space in any of its reservoirs covered by this biological opinion to any use other than salmon flow augmentation, the USBR shall consult with NMFS under section 7(a)(2) of the ESA. Such consultations shall identify the amount of discretionary storage being sought, the current probability of such storage being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment.

9.2.2 Water Quality

The impact of the USBR serviced lands on nutrient, temperature, and sediment loads in the Snake River basin upstream of Brownlee Dam has not been determined at present (Section 6.3.2). USBR, in coordination with IDEQ and ODEQ, should:

1. Prepare a water balance for the Snake River between Murphy and Weiser Idaho for representative wet, dry, and average years to assist in fair and equitable allocation of waste loads in the Snake River-Hells Canyon TMDL. The flow analysis will include all major tributary inflows, direct irrigation pumping from the Snake River, and surface and ground water runoff from irrigated agricultural lands which drain directly to the Snake River.

2. Participate in coordinated monitoring of the nutrient loads and temperatures of major tributaries and return flows to the Snake River to (a) assist the states in modeling and allocation of pollutant loads to the Hells Canyon Reservoir complex, (b) develop design criteria for water quality improvement projects, and (c) assist in measuring progress in meeting TMDL load allocations.

3. Work with irrigation districts, canal companies, drainage districts, and other operating entities on Reclamation projects, within the framework of Watershed Advisory Groups, Watershed Councils, and other appropriate public forums in Idaho and Oregon, to develop plans for implementing the Snake River-Hells Canyon TMDL. Efforts will focus on identifying and evaluating system level opportunities to comply with waste load reductions defined under of the Snake River-Hells Canyon TMDL.

4. Assist irrigation system operators and other appropriate entities in implementing nutrient and temperature improvement measures as authorities and funding permit.

9.2.3 Document Outcomes of Flow Augmentation and Water-Saving Measures in 2001

The USBR shall document the allocation of water to the flow augmentation program in 2001, including defining the amount and approximate time of delivery to Snake River streamflows of each source of water delivered. The USBR shall seek out information on the nature and hydrologic outcomes of various water savings programs and other programs with a high potential for saving water (e.g., Idaho Power Company power buy-back), describe the ultimate outcome of such storage (e.g., natural flow accrual, storage, rental, and other) and shall identify those programs with the highest potential for streamflow improvement in the event of future droughts. These data shall be presented in the form of a report to NMFS at least 135 days prior to the termination date of this biological opinion.

10. CONSERVATION RECOMMENDATIONS

Section 10 discusses NMFS' obligation to develop conservation recommendations under Section 7(a)(1) of the ESA, which directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid the potential adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of critical habitat, to develop additional information, or to assist the Federal agencies in complying with the obligations under Section 7(a)(1) of the ESA. NMFS believes that the following conservation recommendations are consistent with these obligations and, therefore, supports their implementation by the Action Agencies.

10.1 Cooperate with Agencies and Private Entities to Develop and Evaluate Operations that Benefit ESA-listed Species

The USBR should continue working with Federal, state, and private entities to develop and evaluate operations that would benefit ESA-listed species. Specifically:

1. Support state authorized watershed planning efforts, facilitating appropriate measures to protect adequate instream flows and equitable approaches to increasing streamflows and the water available for flow augmentation.

2. The USBR should support modifications to rental pool rules that would improve USBR's access to water for flow augmentation.

10.2 Pursue Opportunities to Conserve Water

The USBR should continue to work with Idaho Department of Water Resources (IDWR) to prevent:

1. Water delivery to spaceholders in amounts in excess of the spaceholder contracts held by each spaceholder for each project,

2. Water delivery in excess of state-authorized water rights held by individuals and entities served by each project, and

3. Water use at rates in excess of that needed to reasonably support the beneficial use to which it is applied (wasteful).

10.3 Pursue Opportunities to Manage Water More Effectively

The USBR should continue to evaluate opportunities to assist water users throughout the region to manage their water more effectively, including but not limited to: improving water measurement, accurate water accounting, minimizing conveyance losses, and minimizing environmental impacts to instream and other watershed resources.

10.4 Pursue Opportunities to Improve Water Accounting

The USBR should continue to work with Idaho Power Company, IDWR, and the watermasters to provide an annual accounting of the water delivered to Brownlee Reservoir, including:

1. A brief introduction or summary describing:

   - The quantity of water released by the USBR for salmon flow augmentation,
   - the quantity of water delivered to the Snake River by the USBR from the Oregon natural flow program,
   - the quantity of natural streamflow diverted upstream of Brownlee Reservoir not specifically authorized by state water rights,
   - the quantity of salmon flow augmentation water delivered downstream from Hells Canyon Dam during the salmon outmigration period (April 3 through August 31),
   - any difficulties encountered in making releases or achieving timely delivery of the salmon flow augmentation water,
   - the quantity of flood control water evacuated between August 1 and October 15.

2. A detailed description of salmon flow augmentation deliveries for each basin (Upper Snake, Payette, Boise, and Oregon natural flows) including:

   - A breakdown for each project in the basin describing the quantities delivered from uncontracted space, powerhead space, rental pool, or natural flow right,
   - a description of the timing of releases from each basin, and
   - a description of how water was shaped by Idaho Power Company from out-of-season USBR releases into the salmon outmigration season.

3. Detailed description of how actual operations conform with the Salmon Flow Augmentation Plan including:

   - The cause(s) of any deviations from the plan and
   - any remedial actions the USBR proposes to undertake to avoid or minimize such deviations in the future.

11. REINITIATION OF CONSULTATION

This biological opinion covers only the operation and maintenance of 10 USBR projects in the upper Snake River Basin and provision of water for flow augmentation through March 31, 2002, as specified in Section 1.

This concludes formal consultation on the actions outlined in the USBR's biological assessment. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

12. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of Essential Fish Habitat (EFH) descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH.

"The term "essential fish habitat" means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (MSA section 3). "For the purpose of interpreting the definition of essential fish habitat: *Waters* include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; *substrate* includes sediment, hard bottom, structures underlying the waters, and associated biological communities; *necessary* means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle" (50 CFR 600.10).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;

- NMFS shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;

- Federal agencies shall within 30 days after receiving conservation recommendations from NMFS provide a detailed response in writing to NMFS regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NMFS, the Federal agency shall explain its reasons for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NMFS is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

The objective of this EFH consultation is to identify potential adverse effects resulting from the proposed action as described in Section 3 of this biological opinion, and to recommend conservation measures to avoid, minimize, or otherwise offset the anticipated adverse effects to EFH resulting from the proposed action.

12.1 Identification of EFH

The Pacific Fishery Management Council (PFMC) has designated EFH for Federally-managed groundfish, coastal pelagics, and salmon [chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and Puget Sound pink salmon (*O. gorbuscha*) fisheries within the waters of Washington, Oregon, and California.

Designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km)(PFMC 1998a, 1998b). Detailed descriptions and identification of EFH for the groundfish species are found in the Final Environmental Assessment/Regulatory Impact Review for Amendment 11 to The Pacific Coast Groundfish Management Plan (PFMC 1998a) and NMFS Essential Fish Habitat for West Coast Groundfish Appendix (Casillas et al. 1998). Detailed descriptions and identifications of EFH for the coastal pelagic species are found in Amendment 8 to the Coastal Pelagic Species Fishery Management Plan (PFMC 1998b).

Freshwater EFH for Federally-managed Pacific salmon includes all those rivers, streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except above the impassable barriers identified by PFMC (1999). Chief Joseph Dam, Dworshak Dam, and the Hells Canyon Complex (Hells Canyon, Oxbow, and Browne dams) are among the listed man-made barriers that represent the upstream extent of the Pacific salmon fishery EFH. Freshwater salmon EFH excludes areas upstream of longstanding, naturally impassable barriers (e.g., natural waterfalls in existence for several hundred years). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border. Detailed descriptions and identification of EFH for Pacific salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999).

Assessment of the potential adverse effects to these species’ EFH from the proposed action is based on the above information.

12.2 Proposed Action

The proposed action is detailed above in Section 3 of this supplemental biological opinion and entails 10 USBR projects in the upper Snake River basin involving water storage, streamflow depletions, and irrigation return flow considerations with regard to designated EFH below the Hells Canyon Complex.

The proposed action area is that part of the Federally-managed species EFH that is affected by USBR project operations, as described in Section 5.1 of this supplemental biological opinion. The proposed action area with regard to EFH includes the farthest upstream point at which Federally-managed salmon fisheries smolts enter (or adults exit) the Snake River and Columbia River (at, and downstream of, its confluence with the Snake River) to the farthest downstream point at which they exit (or adults enter) the migration corridor to the ocean.

In the Snake River, the proposed action area for EFH translates to immediately below Hells Canyon Dam (or wherever a tributary stream meets the Snake River below Hells Canyon Dam) to the confluence of the Snake and Columbia rivers. In the Columbia River, the proposed action area for EFH begins at its confluence with the Snake River (or wherever a tributary stream meets the Columbia River downstream of its confluence with the Snake River) and extends downstream to the farthest point at the Columbia River estuary and nearshore ocean environment for which designated EFH for groundfish, coastal pelagics, chinook, and coho salmon might be influenced by USBR project operations (Table 12-1).

12.3 Effects of Proposed Action

Because the operation of the proposed USBR upper Snake River projects affects the quality, quantity, and timing of water flowing in the Snake and Columbia rivers, the action area, for the purposes of evaluating the effect of these operations on designated EFH, is defined as the Snake River at Hells Canyon Dam downstream to the Columbia River plume and nearshore ocean environment. The effects of the USBR's upper Snake River projects designated salmon EFH is strongest at Hells Canyon Dam (the upstream limit of salmon EFH on the Snake River) and diminishes in a downstream direction as the relative contribution of water from the upper Snake River basin diminishes.

As described in detail in Section 6, the proposed operation of the 10 USBR projects in the upper Snake River basin considered in this supplemental biological opinion results in water storage, streamflow depletions, and irrigation return flows. The primary effects of these activities in the Snake River downstream from the Hells Canyon Complex are related to reduced streamflows and reduced water quality in the juvenile and adult migration corridors, in spawning and rearing areas, and in areas used for growth and development to adulthood (the Columbia River estuary and plume). However, it is anticipated that the relative effect of USBR operations in the upper Snake River basin on water quantity and quality (e.g., changes in temperature regimes and dissolved oxygen) will diminish with distance downstream. The data needed to fully evaluate project contributions and thus the specific effects of USBR storage and return flows on water quantity and quality in the Snake River downstream from the Hells Canyon Complex is not presently available. Therefore, only a preliminary delineation of the effects of the proposed action can be made at this time (USBR 2001).

The USBR is gathering water quality data from a number of sites in cooperation with other state and local entities to define water quality effects of tributary inflows, including project return flows, on conditions in the mainstem Snake River (USBR 2001). This information should provide a base of information upon which to better define the effects of these projects on water quality in future EFH consultations.

Table 12-1. Species with designated EFH found in waters of the proposed USBR action area.

Groundfish Species	Blue rockfish (S. mystinus)	Rougheye rockfish (S. aleutianus)	Flathead sole (Hippoglossoides elassodon)
Leopard shark (Triakis semifasciata)	Bocaccio (S. paucispinis)	Sharpchin rockfish (S. zacentrus)	Pacific sanddab (Citharichthys sordidus)
Soupfin shark (Galeorhinus zyopterus)	Brown rockfish (S. auriculatus)	Shortbelly rockfish (S. jordani)	Petrale sole (Eopsetta jordani)
Spiny dogfish (Squalus acanthias)	Canary rockfish (S. pinniger)	Shortraker rockfish (S. borealis)	Rex sole (Glyptocephalus zachirus)
Big skate (Raja binoculata)	Chilipepper (S. goodei)	Silvergray rockfish (S. brevispinus)	Rock sole (Lepidopsetta bilineata)
California skate (R. inornata)	China rockfish (S. nebulosus)	Speckled rockfish (S. ovalis)	Sand sole (Psettichthys melanostictus)
Longnose skate (R. rhina)	Copper rockfish (S. caurinus)	Splitnose rockfish (S. diploproa)	Starry flounder (Platyichthys stellatus)
Ratfish (Hydrolagus colliei)	Darkblotched rockfish (S. crameri)	Stripetail rockfish (S. saxicola)	
Pacific rattail (Coryphaenoides acrolepsis)	Grass rockfish (S. rastrelliger)	Tiger rockfish (S. nigrocinctus)	**Coastal Pelagic Species**
Lingcod (Ophiodon elongatus)	Greenspotted rockfish (S. chlorostictus)	Vermillion rockfish (S. miniatus)	Northern anchovy (Engraulis mordax)
Cabezon (Scorpaenichthys marmoratus)	Greenstriped rockfish (S. elongatus)	Widow Rockfish (S. entomelas)	Pacific sardine (Sardinops sagax)
Kelp greenling (Hexagrammos decagrammus)	Longspine thornyhead (Sebastolobus altivelis)	Yelloweye rockfish (S. ruberrimus)	Pacific mackerel (Scomber japonicus)
Pacific cod (Gadus macrocephalus)	Shortspine thornyhead (Sebastolobus alascanus)	Yellowmouth rockfish (S. reedi)	Jack mackerel (Trachurus symmetricus)
Pacific whiting (Hake) (Merluccius productus)	Pacific Ocean perch (S. alutus)	Yellowtail rockfish (S. flavidus)	Market squid (Loligo opalescens)
Sablefish (Anoplopoma fimbria)	Quillback rockfish (S. maliger)	Arrowtooth flounder (Atheresthes stomias)	
Aurora rockfish (Sebastes aurora)	Redbanded rockfish (S. babcocki)	Butter sole (Isopsetta isolepsis)	**Salmon**
Bank Rockfish (S. rufus)	Redstripe rockfish (S. proriger)	Curlfin sole (Pleuronichthys decurrens)	Coho salmon (O. kisutch)
Black rockfish (S. melanops)	Rosethorn rockfish (S . helvomaculatus)	Dover sole (Microstomus pacificus)	Chinook salmon (O. tshawytscha)
Blackgill rockfish (S. melanostomus)	Rosy rockfish (S. rosaceus)	English sole (Parophrys vetulus)	

Sources: Casillas et al. 1998, Eschmeyer et al. 1983, Miller and Lea 1972, Monaco et al. 1990, Emmett et al. 1991, Turner and Sexsmith 1967, Roedel 1953, Phillips 1957, Roedel 1948, Phillips 1964, Fields 1965, Walford 1931, Gotshall 1977, Hart 1973, Healey 1991, Sandercock 1991, and Dees 1961.

12.4 Conclusion

NMFS believes that the proposed action may adversely affect the EFH for the groundfish, coastal pelagic, and Pacific salmon species listed in Table 12-1.

12.5 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations for any Federal or state agency action that would adversely affect EFH. Conservation measures are discretionary measures suggested to avoid, minimize, or otherwise offset adverse modification of EFH, or to develop additional information. The conservation measures described in Section 10 of this supplemental biological opinion are applicable to designated groundfish, coastal pelagics, and Pacific salmon EFH, and therefore represent the statutory conservation recommendations provided by NMFS pursuant to section 305(b)(4)(A) of the MSA with regard to the proposed action.

12.6 Statutory Response Requirement

The MSA [section 305(b)] and 50 CFR 600.920(j) requires the USBR to provide a written response to NMFS' EFH conservation recommendations within 30 days of receipt of this combined biological opinion under the Endangered Species Act (ESA) and EFH consultation. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. If the response is inconsistent with NMFS' conservation recommendations, the reasons for not implementing NMFS' recommended conservation measures according to the MSA [section 305(b)] and 50 CFR 600.920(j) shall be explained by the USBR.

12.7 Consultation Renewal

The USBR must reinitiate EFH consultation with NMFS if either the proposed action is substantially revised or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920).

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